MAINTENANCE MANUAL

SYSTEMS, INC.

AN900 SERIES
SPECTRUM ANALYZER

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MP MASTER
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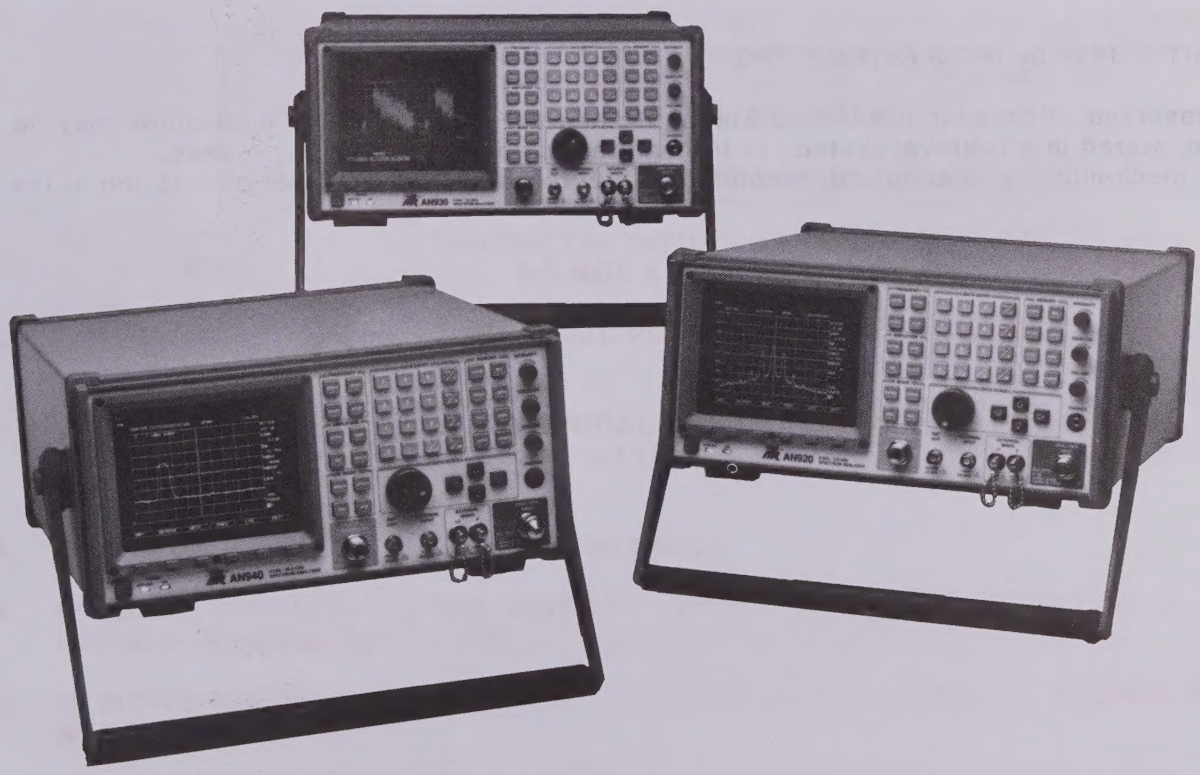
SYSTEMS, INC.

MAINTENANCE MANUAL

AN900 SERIES
SPECTRUM ANALYZER



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WARNING!
HIGH VOLTAGE EQUIPMENT:
FOR QUALIFIED SERVICING TECHNICIANS ONLY

THIS EQUIPMENT CONTAINS CERTAIN CIRCUITS AND COMPONENTS OF EXTREMELY HIGH VOLTAGES, CAPABLE OF CAUSING SERIOUS BODILY INJURY OR DEATH. WHEN PERFORMING MAINTENANCE PROCEDURES ON THIS EQUIPMENT, HEED ALL WARNINGS THAT FOLLOW AND REFER TO THE "SAFETY FIRST" PAGES IN THE OPERATION MANUAL FOR PRECAUTIONARY MEASURES.

1. BE SURE TO SERVICE ONLY WHEN ANOTHER PERSON IS PRESENT WHO IS CERTIFIED TO PERFORM FIRST AID FOR ELECTRICAL SHOCK AND CARDIO-PULMONARY RESUSCITATION (CPR). STEPS IN THE PROCEDURES BELOW MARKED WITH AN ASTERISK (*), ASSUME SUCH CERTIFICATION.

2. EXERCISE CAUTION WHILE SERVICING EQUIPMENT WHEN POWER IS TURNED ON. TURN OFF POWER TO THE UNIT BEFORE REMOVING COVERS, PANELS, PC BOARDS, CANNISTERS, OR BEFORE ENGAGING IN ANY OTHER ACTIVITY THAT COULD RESULT IN DIRECT CONTACT WITH AN ELECTRICAL CURRENT, SUCH AS REMOVING AND SOLDERING COMPONENTS.

3. TO PREVENT ELECTRICAL SHOCK OR EQUIPMENT DAMAGE, ALWAYS CHECK THAT YOUR EQUIPMENT IS PROPERLY GROUNDED PRIOR TO CONNECTING WITH POWER SOURCE. THIS EQUIPMENT IS CAPABLE OF PRODUCING A MAXIMUM OF 120 VAC (U.S./CANADA) OR 240 VAC (EUROPE).

RESCUE AND FIRST AID FOR SHOCK VICTIMS

1. STOP MOMENTARILY TO ASSESS THE SITUATION. CALL FOR HELP FROM YOUR FIRST AID REPRESENTATIVE. DO NOT ATTEMPT TO PULL OR GRAB THE VICTIM.

2. IF POSSIBLE, TURN OFF ELECTRICAL POWER SOURCE AND REMOVE POINT OF CONTACT FROM VICTIM.

3. IF YOU CANNOT TURN OFF ELECTRICAL POWER: USE A WOODEN POLE, ROPE OR SOME OTHER DRY INSULATING MATERIAL TO PUSH, PULL OR LIFT THE VICTIM TO SAFETY.

4. SEND FOR A DOCTOR AND/OR AMBULANCE.

*5. IF VICTIM'S BREATHING HAS STOPPED: YOUR FIRST AID REPRESENTATIVE SHOULD IMMEDIATELY BEGIN TO TAKE STEPS IN ADMINISTERING CPR.

*6. IF VICTIM IS BREATHING: ATTEMPT TO CONTROL ALL SERIOUS BLEEDING, IF NEEDED.

7. IF THERE IS NO BLEEDING OR BLEEDING IS STOPPED: KEEP VICTIM WARM AND FLAT ON HIS/HER BACK.

WARNING: **DEVICES MUST NOT BE INSERTED NOR REMOVED FROM CIRCUITS WITH POWER ON.**

CAUTION: INTEGRATED CIRCUITS AND SOLID STATE DEVICES SUCH AS MOS FETS, ESPECIALLY CMOS TYPES, ARE SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGES RECEIVED FROM IMPROPER HANDLING, USE OF UNGROUNDED TOOLS AND IMPROPER STORAGE AND PACKAGING. ANY MAINTENANCE TO THIS UNIT MUST BE PERFORMED WITH THE FOLLOWING PRECAUTIONS:

- BEFORE USING A CIRCUIT, KEEP ALL LEADS SHORTED TOGETHER WITH VENDOR-SUPPLIED SHORTING SPRINGS OR BY INSERTING LEADS INTO A CONDUCTIVE MATERIAL.
- GROUND THE HAND BEING USED TO REMOVE DEVICES FROM CONTAINERS WITH A CONDUCTIVE WRISTBAND. REMOVE ALL METAL JEWELRY BEFORE WORKING WITH DEVICES.
- TIPS OF SOLDERING IRONS, AND ALL OTHER TOOLS, MUST BE GROUNDED WHEN USED.
- PC BOARDS, WHEN REMOVED FROM EQUIPMENT, MUST BE LAID ON A GROUNDED CONDUCTIVE MAT OR STORED IN A CONDUCTIVE STORAGE BAG. REMOVE ANY BUILT-IN POWER SOURCE, SUCH AS A BATTERY, BEFORE LAYING PC BOARDS ON A CONDUCTIVE MAT OR STORING IN A CONDUCTIVE BAG.
- PC BOARDS, IF BEING SHIPPED TO THE FACTORY FOR REPAIR, MUST BE PACKAGED IN A CONDUCTIVE BAG AND PLACED IN A WELL-CUSHIONED SHIPPING CONTAINER.

THE USE OF SIGNAL GENERATORS FOR MAINTENANCE AND OTHER ACTIVITIES CAN BE A SOURCE OF ELECTROMAGNETIC INTERFERENCE (EMI) TO COMMUNICATION RECEIVERS, WHICH CAN CAUSE DISRUPTION AND INTERFERENCE TO COMMUNICATION SERVICE OUT TO A DISTANCE OF SEVERAL MILES.

USERS OF THIS EQUIPMENT SHOULD SCRUTINIZE ANY OPERATION WHICH RESULTS IN RADIATION OF A SIGNAL (DIRECTLY OR INDIRECTLY) AND SHOULD TAKE NECESSARY PRECAUTIONS TO AVOID POTENTIAL COMMUNICATION INTERFERENCE PROBLEMS.

SAFETY FIRST:
TO ALL OPERATIONS & SERVICE PERSONNEL

READ AND LEARN THESE PAGES IN THEIR ENTIRETY. THE EXPLANATIONS GIVEN APPLY TO BOTH OPERATORS AND SERVICE PERSONNEL AS A MATTER OF SAFETY WHEN USING THIS PRODUCT AND WHEN REFERENCING THIS MANUAL.

REFER ALL SERVICING OF UNIT TO QUALIFIED TECHNICAL PERSONNEL.

SAFETY IDENTIFICATION IN TECHNICAL MANUAL

The following terms are used throughout this manual to draw attention to possible safety hazards, which may exist when operating or servicing this equipment.

CAUTION: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES WHICH, IF IGNORED, CAN RESULT IN EQUIPMENT OR PROPERTY DAMAGE (E.G., FIRE).

WARNING: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES WHICH, IF IGNORED, CAN RESULT IN PERSONAL INJURY OR DEATH.

SAFETY IDENTIFICATION USED IN EQUIPMENT

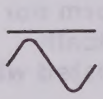
Markings identified with the terms CAUTION and DANGER are to be addressed before accessing that part of the device.

CAUTION: A HAZARD EXISTS WHICH, IF IGNORED, COULD RESULT IN DAMAGE TO THE DEVICE OR PROPERTY. SUCH A MARKING IS NOT LIKELY TO CAUSE PERSONAL INJURY IN THE VICINITY OF THE MARKING.

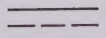
DANGER: A PERSONAL INJURY HAZARD EXISTS AT THE IMMEDIATE PLACEMENT OF THE MARKING ON THE DEVICE. SPECIAL PRECAUTIONS MUST BE OBSERVED WHEN REQUIRED TO PERFORM ANY TASK IN THE VICINITY OF THESE MARKINGS.

SAFETY SYMBOLS IN MANUALS & ON UNITS

INFORMATION PRECAUTION: Corresponds with an applicable item on the device and in the manual. This symbol defines specific voltage, current and power requirements or other related information for safe operation or service of equipment.



AC OR DC TERMINAL: Terminal which may supply or be supplied with ac or dc.



DC TERMINAL: Terminal which may supply or be supplied with dc or direct voltage.

AC TERMINAL: Terminal which may supply or be supplied with ac or alternating voltage.

SWITCH OFF: Ac line power to the device is OFF.

SWITCH ON: Ac line power to the device is ON.

POWER SUPPLY

This device is intended for operation from a power source no more than 120 VAC (North American)/240 VAC (European) at a frequency of 50 to 400 Hz. Power supply specifications are provided within the manual.

EQUIPMENT GROUNDING PRECAUTION

When equipment is connected to ac power, it must be connected to LOAD, NEUTRAL and GROUND inputs at their respective points of contact. Improper grounding of equipment can result in electrical shock anywhere on the device, even if it appears to be insulated.

USE OF PROBES

Check the maximum voltage, current and power ratings of any connector on the equipment in the product specifications prior to connecting it with a probe from a terminal device. Be sure the terminal device performs within these specifications prior to using it for measurement, to prevent electrical shock or damage to the equipment.

POWER CORDS

Power cords are supplied specifically for use with this product for 12 Vdc and 120 VAC operation (U.S.). The power cord must not be frayed, broken nor expose bare wiring when operating AN900 Series Spectrum Analyzers, to prevent electrical shock, fires and to protect other equipment.

USE RECOMMENDED FUSES ONLY

Fuses are provided to prevent electrical fire and for protection of equipment. Use only fuses specifically recommended for the equipment at the specified current and voltage ratings.

OPERATION OF EQUIPMENT IN HAZARDOUS ENVIRONMENT

Do not operate equipment in an explosive environment, out of doors in an electrical storm nor under any other such dangerous circumstances, unless the equipment has been specifically designated for use in such an adverse environment. Environmental requirements are listed with the specifications of this product.

LIST OF EFFECTIVE PAGES

The manual pages listed below which are affected by a current change or revision, are so identified by a revision number and an asterisk.

Date of issue for original and changed pages are:

Original . . . . . 0 . . . . . March 1, 1994

TOTAL NUMBER OF PAGES IN THIS MANUAL IS 306 CONSISTING OF THE FOLLOWING:

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xii Blank	0	B-1 through B-3	0
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PREFACE

SCOPE

This manual contains maintenance instructions for AN900 Series Spectrum Analyzers (AN920, AN930, AN930A, AN940). The information in this manual enables servicing technicians to:

- Service, test or replace any major assembly within AN900 Series Spectrum Analyzers.
- Maintain operating conditions of AN900 Series Spectrum Analyzers to the expected performance standards.
- Understand principles of operation, relating to the overall operation of AN900 Series Spectrum Analyzers as well as functional operation within the major assemblies.

ORGANIZATION

The AN900 Series Maintenance Manual is composed of the following sections:

SECTION 1 - INTRODUCTION

Provides a brief description of the electrical and mechanical configuration of AN900 Series Spectrum Analyzers, intended to familiarize the technician with the overall structure of the various sets.

SECTION 2 - THEORY OF OPERATION

Describes how AN900 Series Spectrum Analyzers operate on three levels of complexity: system level, interactive functional level and functionally at a module (assembly) level.

SECTION 3 - CALIBRATION/VERIFICATION

Provides step by step procedures for verifying operation of and calibrating AN900 Series Spectrum Analyzers.

SECTION 4 - REPLACEMENT

Provides step by step procedures for removing and installing major assemblies within AN900 Series Spectrum Analyzers.

SECTION 5 - PREVENTIVE MAINTENANCE

Contains routine instructions for cleaning and inspecting AN900 Series Spectrum Analyzers.

SECTION 6 - MECHANICAL ASSEMBLIES, PC BOARDS AND SCHEMATICS

Contains drawings to aid the technician in isolating a dysfunctional major assembly.

SECTION 7 - PARTS LIST

Provides drawings with part listings for ordering replaceable parts within AN900 Series Spectrum Analyzers.

APPENDICES

Contains useful supplementary data and test equipment information.

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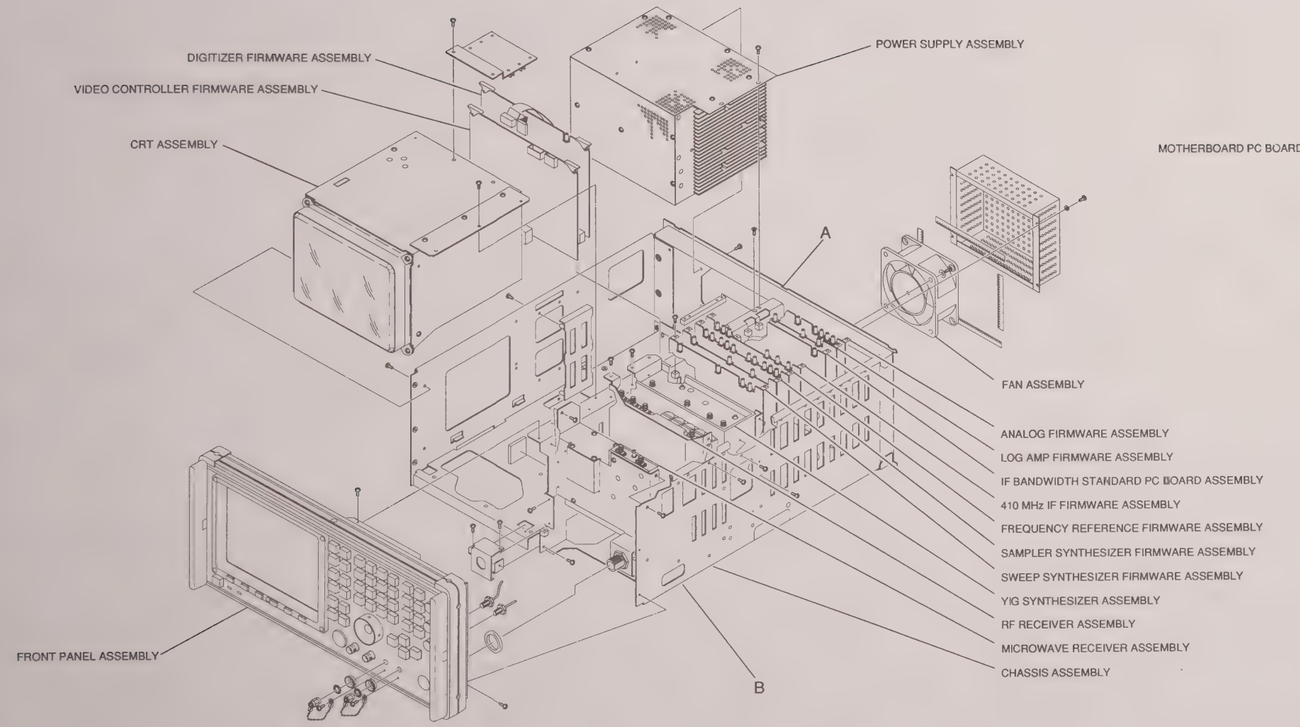
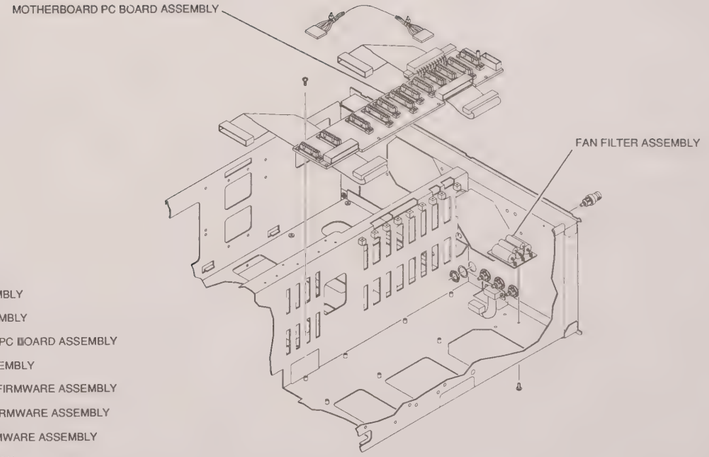
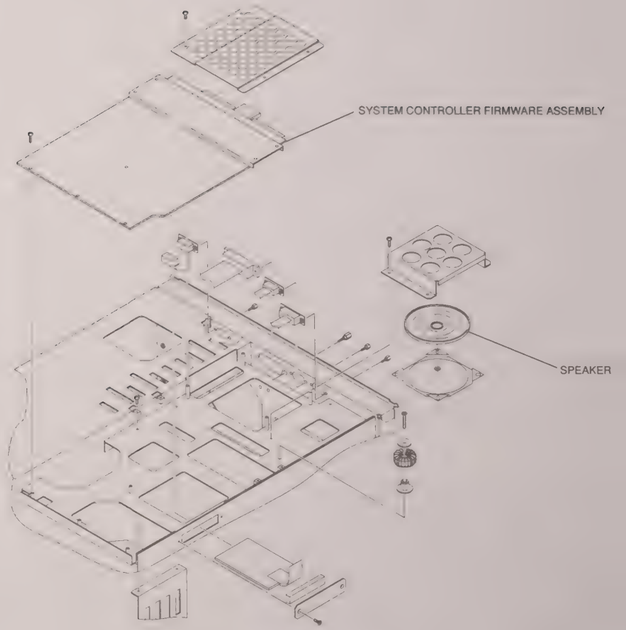


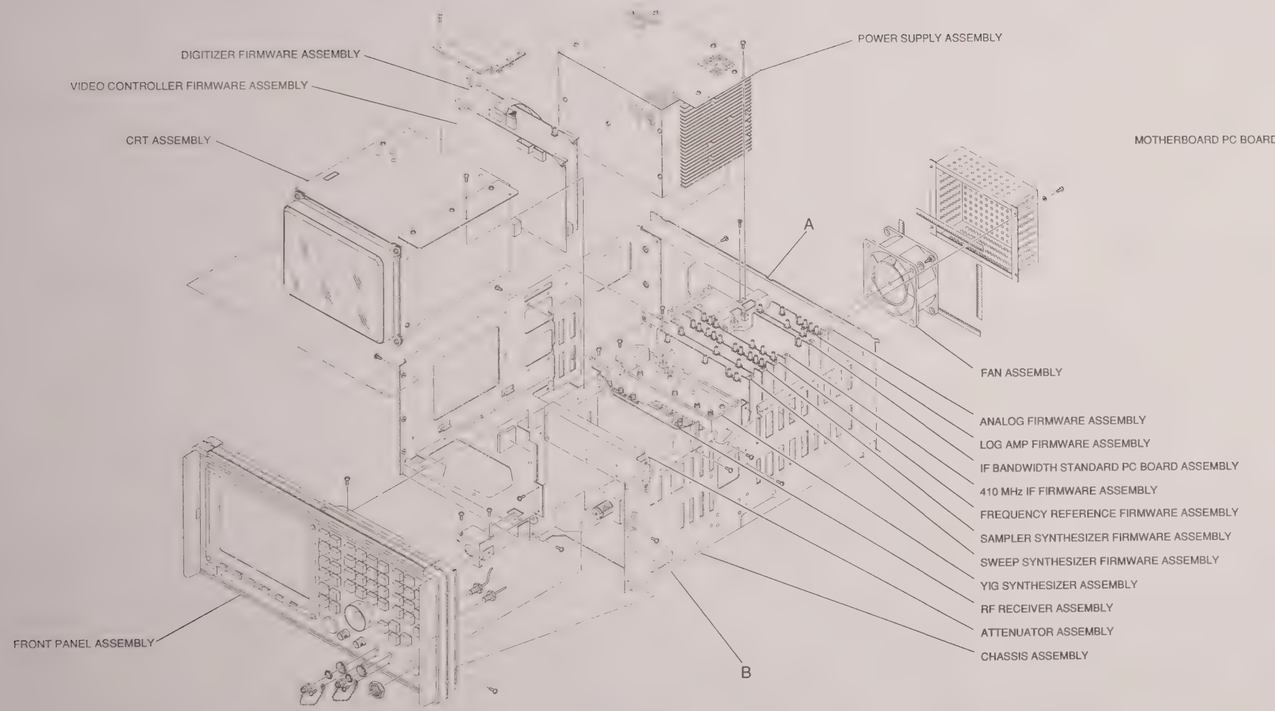


DETAIL A



DETAIL B

Figure 1-1 Composite (Sheet 1 of 2)



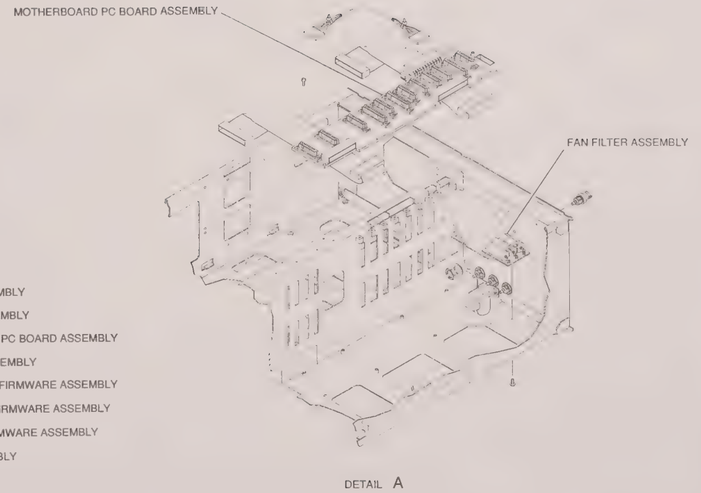


Figure 1-1 Composite (Sheet 2 of 2)

SECTION 1 - INTRODUCTION

1-1 GENERAL

This section contains a brief description of the internal electrical and mechanical configuration of the AN900 Series Spectrum Analyzers, providing the technician with an overall view of the product structure.

1-2 ELECTRICAL DESCRIPTION

AN900 Series Spectrum Analyzers are microprocessor controlled. Each unit synthesizes accurate digital representations of received modulated RF signals. Accepted input frequencies range from 0 Hz to 2.9 GHz (AN920), 22 GHz (AN930 or AN930A) or 26.5 GHz (AN940). The AN930, AN930A and AN940 uses three overlapping frequency bands: Band 0 (0 Hz to 2.9 GHz), Band 1 (2.6 to 12.0 GHz) and Band 2 (≥11.5 GHz). AN900 Series Spectrum Analyzers also function as frequency counters, digital osciloscopes or FM/AM Receivers.

Electronic assemblies in an AN900 Series Spectrum Analyzer are as follows:

Front Panel Assembly
Attenuator Assembly (N/A for AN930, AN930A or AN940)
Microwave Receiver Assembly (N/A for AN920)
RF Receiver Assembly
YIG Synthesizer Assembly
Sweep Synthesizer Firmware Assembly (contains PC Board Assembly)
Sampler Synthesizer Firmware Assembly (contains PC Board Assembly)
Frequency Reference Firmware Assembly (contains PC Board Assembly)
410.7 MHz IF Firmware Assembly (contains PC Board Assembly)
IF Bandwidth Standard PC Board Assembly
Log Amp Firmware Assembly (contains PC Board Assembly)
Analog Firmware Assembly (contains PC Board Assembly)
CRT Assembly
Video Controller Firmware Assembly (contains PC Board Assembly)
Digitizer Firmware Assembly (contains PC Board Assembly)
Power Supply Assembly
Mother Board PC Board Assembly
Fan Filter Assembly
System Controller Firmware Assembly (contains PC Board Assembly)
Tracking Generator Assembly (Option 02)
IF Bandwidth Option PC Board Assembly (Supplemental Bandwidth Filters [Option 07 for AN930] or Quasi-Peak Detector [Option 08])
High Stability Time Base (Option 09)
Medium Stability Time Base (Non-Option 09)

1-3 MECHANICAL DESCRIPTION

Figure 1-1 displays exploded composite views of AN900 Series Spectrum Analyzers, identifying and locating major assemblies (modules) for the maintaining technician. Figure 1-2 identifies assemblies (modules) used in the available options.

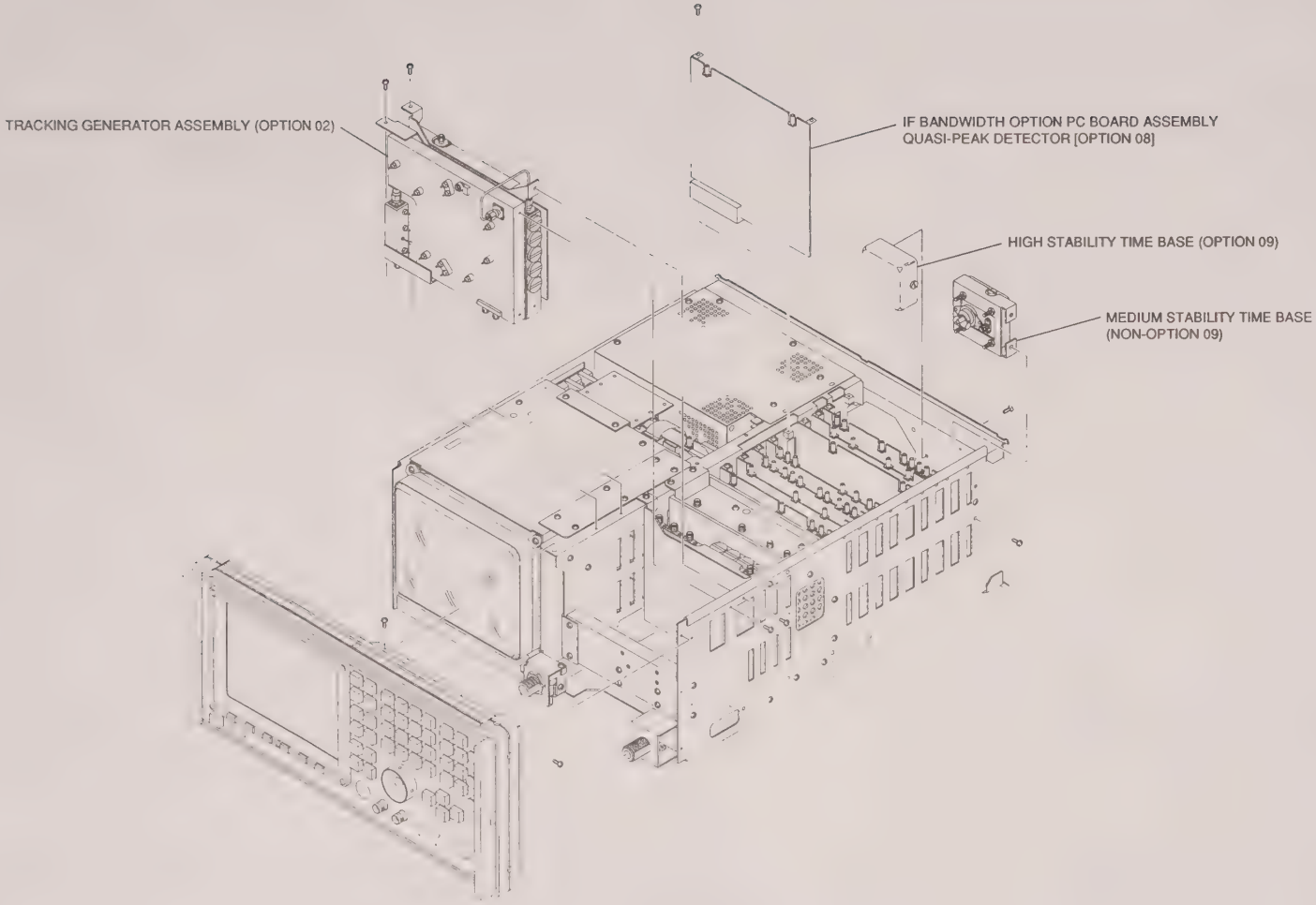
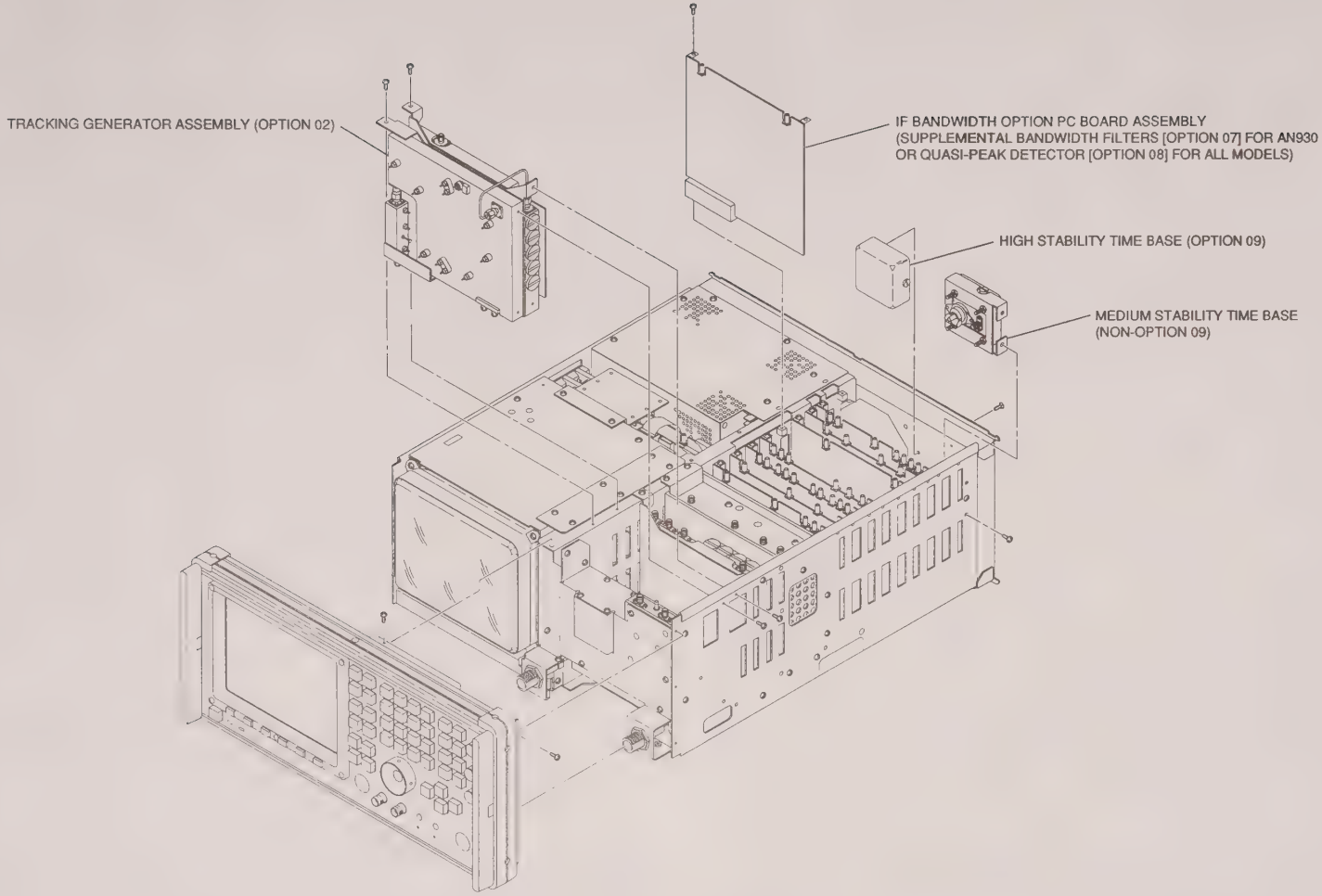


Figure 1-2 Composite with Options (Sheet 2 of 2)



Composite with Options for AN930, AN930A and AN940

7220008

Figure 1-2 Composite with Options (Sheet 1 of 2)

SECTION 2 - THEORY OF OPERATION

2-1 GENERAL

This section provides the maintenance technician with unit operation concepts for the AN920, AN930, AN930A and AN940. Theory of Operation is divided into three subsections with each level more detailed in explaining actions performed within the unit. The subsections are:

- System Theory of Operation

  System Theory provides a simplified explanation of the overall unit function.

- Functional Theory of Operation

  Functional Theory describes the signal path during each basic operation, lists general effects the different areas have on the signal and details the different modules involved.

- Module Theory of Operation

  Module Theory explains the process in each module to functional block level. Dependencies on other modules and signal manipulation in the module are described at a functional level.

NOTE: Connector call-outs are prefixed according to Spectrum Analyzer Model (72A1 for AN930, 02A1 for AN920, 03A1 for AN930A and 04A1 for AN940) (e.g. A3J3 for the AN920 is 02A1A3J3.).

2-2 SYSTEM THEORY OF OPERATION

Refer to Figure 2-1 (AN920) or 2-2 (AN930, AN930A, AN940).

The synthesized, phase locked Spectrum Analyzer has a frequency range of up to 2.9 GHz (AN920), 22 GHz (AN930, AN930A) or 26.5 GHz (AN940). The microprocessor controlled unit incorporates high speed digital hardware to provide a 5 MHz video bandwidth with the internal display. Versatile Sweep Trigger options (external, video, automatic single sweep, manual single sweep, trigger delay and trigger filter for frequency selectivity), variable Sweep Times (200 ns to 10 s per division) and a 16 kilobyte sample depth (for most operating modes) allow exceptional pulse and complex signal examination.

The unit is a superheterodyne type of receiver with one to four conversions, depending on input frequency and operating mode. Refer to Table 2-1. The 410 MHz Firmware Assembly provides the 10.7 MHz detection signal for normal bands (<10 MHz RBW) or the wideband 410.7 MHz signal. The Log Amp Assembly converts the 10.7 MHz detection signal to a selected logarithmic or linear video signal. The Analog Firmware Assembly demodulates the 10.7 MHz detection signal in the AM/FM Receiver mode or counts the signal in the Frequency Counter function. The Analog Firmware Assembly also provides video selection and processing. The Digitizer Firmware Assembly digitizes the analog video data from the Analog Firmware Assembly. The System Controller Firmware Assembly processes and stores the data.

Memory consists of DRAM, EPROM for firmware and NV RAM for calibration and configuration data. User memory, 32 kilobytes (standard for AN930) to 256 kilobytes (standard for AN920, AN930A and AN940; Option 06 for AN930) of SRAM, with battery back up is located on the System Controller Firmware Assembly.

INPUT FREQUENCY	NORMAL BAND (≤5 MHz RBW)	WIDEBAND (≥10 MHz RBW)	FFT or LINEAR DISPLAY
Band 0 (9 kHz to ≤2.9 GHz)	**3** (2-RF Receiver Assembly, 1-410 MHz Firmware Assembly)	**2** (RF Receiver Assembly)	**4** (2-RF Receiver Assembly, 1-410 MHz Firmware Assembly, 1-Log Amp Firmware Assembly)
Band 1 (2.6 to ≤12 GHz) (N/A for AN920)	**2** (1-Microwave Receiver Assembly, 1-410 MHz Firmware Assembly)	**1** (Microwave Receiver Assembly)	**3** (1-Microwave Receiver Assembly, 1-410 MHz Firmware Assembly, 1-Log Amp Firmware Assembly)
Band 2 (≥11.5 GHz) (N/A for AN920)	**2** (1-Microwave Receiver Assembly, 1-410 MHz Firmware Assembly)	**1** (Microwave Receiver Assembly)	**3** (1-Microwave Receiver Assembly, 410 MHz Firmware Assembly, Log Amp Firmware Assembly)

Table 2-1 Frequency Conversions and Locations

The unit receives the normal Spectrum Analyzer signal (9 kHz to 22 GHz) through the ANALYZER INPUT Connector. The Microwave Receiver Assembly (AN930, AN930A and AN940) provides attenuation and down converts high frequency signals in Bands 1 and 2 (>2.6 GHz) for the 410.7 MHz IF output. The Attenuator Assembly provides the attenuation in the AN920. Lower frequency signals in Band 0 (<2.9 GHz) are mixed twice in the RF Receiver Assembly to also provide the 410.7 MHz output. When the Resolution Bandwidth (RBW) is ≤5 MHz, the 410.7 MHz signal is filtered, mixed down to 10.7 MHz and driven through the selected bandwidth filter (IF Bandwidth Option PC Board Assembly or IF Bandwidth Standard PC Board Assembly). The IF Bandwidth Standard PC Board Assembly and Log Amp Firmware Assembly provide signal gain. The Log Amp Firmware Assembly converts the 10.7 MHz IF signal to a relative dc voltage called LOG VIDEO for Logarithmic or Linear display mode. LOG VIDEO is sent through the Analog Firmware Assembly for video filtering, if selected, to the Digitizer Firmware Assembly. The Digitizer Firmware Assembly digitizes the LOG VIDEO signal and passes the digitized information through the System Controller Firmware Assembly to the Video Controller Firmware Assembly for display on the CRT Assembly.

When RBW is ≥10 MHz, the 410.7 MHz Firmware Assembly provides the RBW filtering (10 or 30 MHz), detects any Linear or FM signals, and sends the WIDEBAND VIDEO to the Analog Firmware Assembly. The Analog Firmware Assembly sends the WIDEBAND VIDEO, without video filtering, to the Digitizer Firmware Assembly. The Digitizer Firmware Assembly digitizes the WIDEBAND VIDEO signal and passes the digitized information through the System Controller Firmware Assembly to the Video Controller Firmware Assembly for display on the CRT Assembly.

The unit receives the Oscilloscope signal through the EXTERNAL INPUT Connector. The Front Panel Assembly provides attenuation and preamplification. The Analog Firmware Assembly drives the signal to the Digitizer Firmware Assembly. There, the analog signal is converted to digital data and passed through the System Controller Firmware Assembly to the Video Controller Firmware Assembly for display on the CRT Assembly.

The CRT display is controlled by the Video Controller Firmware Assembly. Data provided by the System Controller Firmware Assembly is processed and stored by the Video Controller Firmware Assembly. Processed data to be displayed is passed to the CRT Assembly by the Video Controller Firmware Assembly.

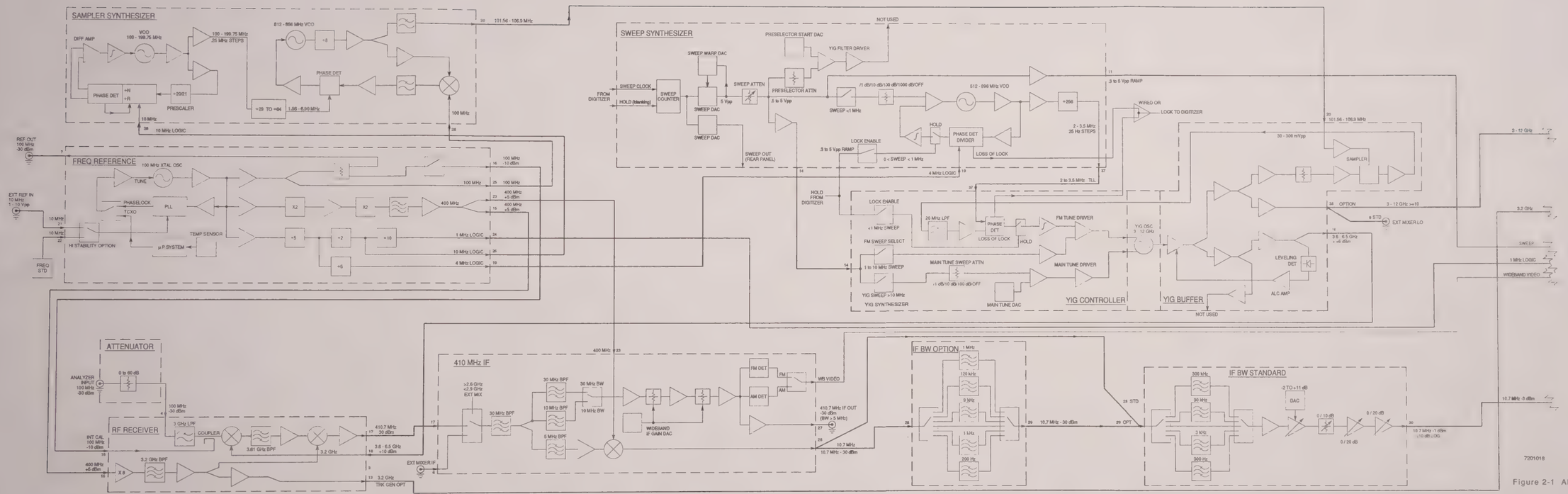


Figure 2-1 AN920 System Block Diagram (Sheet 1 of 2)

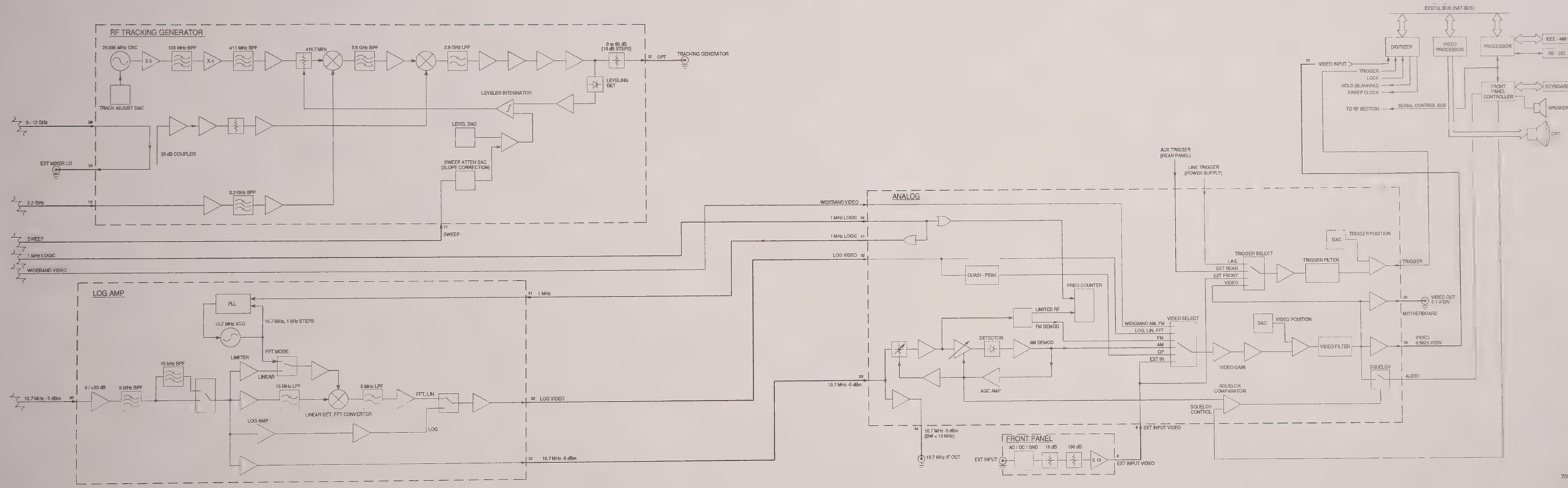


Figure 2-1 AN920 System Block Diagram (Sheet 2 of 2)

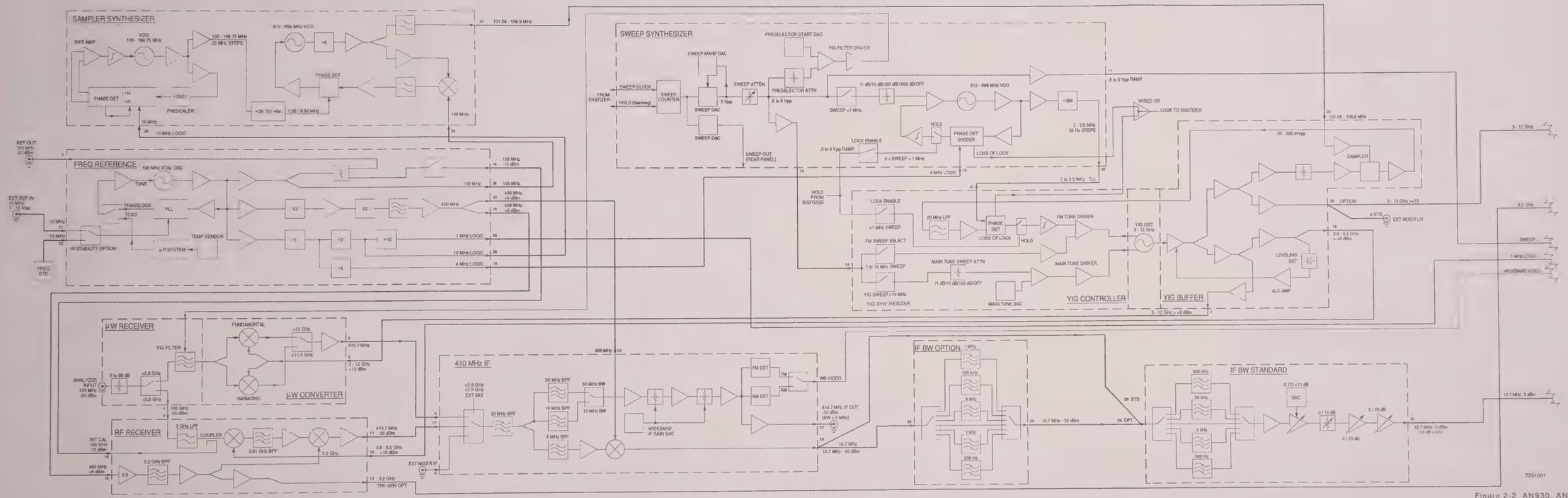


Figure 2-2 AN930, AN930A and AN940 System Block Diagram (Sheet 1 of 2)

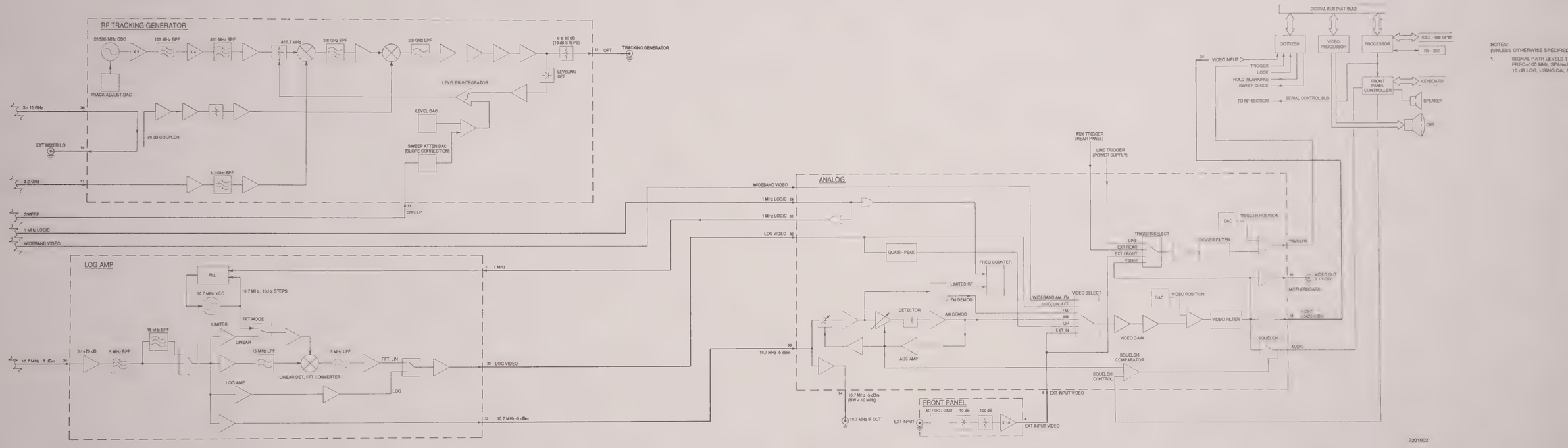


Figure 2-2 AN930, AN930A and AN940 System Block Diagram (Sheet 2 of 2)

2-3 FUNCTIONAL THEORY OF OPERATION

2-3-1 SPECTRUM ANALYZER

Control settings to the System Controller Firmware Assembly processor, determine the start frequency for the spectrum sweep. The System Controller Firmware Assembly processor input to the Main Tune DAC in the YIG Synthesizer Assembly, the Sampler Synthesizer Firmware Assembly output frequency through A3J3 (to set the Start Frequency within 250 or 500 kHz) and the Sweep Synthesizer Firmware Assembly offset output through A13J1 (to set the Start Frequency within 25 Hz) set the YIG oscillator in the YIG Synthesizer Assembly for the correct LO frequency to start the sweep. The start frequency settings are controlled by the Digitizer Firmware Assembly and locked by the phase-locked loops (PLL) in the YIG Synthesizer Assembly and Sweep Synthesizer Firmware Assembly. The Digitizer Firmware Assembly releases the SWEEP HOLD line to begin the sweep cycle. The Sweep Synthesizer sends out the sweep ramp signal causing the YIG oscillator in the YIG Synthesizer Assembly to generate the correct LO frequency for the selected Frequency Span. The Digitizer Firmware Assembly collects baseband data during the sweep. At the end of the sweep, the Digitizer Firmware Assembly activates (low) the SWEEP HOLD line to start the retrace cycle. During retrace, the YIG Synthesizer and Sweep Synthesizer Assemblies relock on the start frequency. When the Digitizer Firmware Assembly receives the YIG LOCK indication from the YIG Synthesizer Assembly and the appropriate sweep trigger from the Analog Firmware Assembly, the Digitizer Firmware Assembly releases (high) the SWEEP HOLD line to end the retrace cycle and begin the sweep cycle again. The Frequency Span setting determines the amplitude and routing of the sweep ramp signal. The Sweep Time setting determines the width or time of the sweep ramp signal. The YIG Synthesizer Assembly provides the synthesized and swept LO to the Microwave and RF Receiver Assemblies.

The Microwave Receiver Assembly (AN930, AN930A and AN940) or Attenuator Assembly (AN920) attenuates (0 to 60 dB) external signals coming through the ANALYZER INPUT Connector (A9J1), according to Attenuation Amplitude control settings. Band 0 signals are sent to the RF Receiver Assembly. Signals in Bands 1 and 2 pass through the YIG Filter. Band 1 signals mix with the LO signal from the YIG Synthesizer Assembly for a 410.7 MHz Microwave Receiver Assembly output (A9J2). Band 2 signals mix with the second harmonic of the LO signal from the YIG Synthesizer Assembly to provide the 410.7 MHz Microwave Receiver Assembly output (A9J2).

Band 0 signals go through a double conversion in the RF Receiver Assembly. In the first conversion, the signal mixes with the 3.6 to 6.5 MHz signal from the YIG Synthesizer Assembly and is filtered for an approximate 3.6107 GHz output. In the second conversion, the 3.6107 GHz signal mixes with the 3.2 GHz signal (generated by multiplying the 400 MHz from the Frequency Reference Firmware Assembly by eight) for a 410.7 MHz RF Receiver Assembly output (A11J1).

The 410 MHz IF Firmware Assembly provides the final conversion. The 410.7 MHz signal mixes with 400 MHz from the Frequency Reference Firmware Assembly to provide a 410 MHz Firmware Assembly output (A14J5) of 10.7 MHz. The 10.7 MHz signal passes through Resolution Bandwidth (RBW) filter on the IF Bandwidth Standard or Option PC Board Assembly. The IF Bandwidth Standard PC Board Assembly also amplifies the signal according to the Gain Amplitude control settings (-10.0 to +45.0 dB). The final gain control amplifier, in the Log Amp Firmware Assembly, extends the selectable gain another 20 dB for a total of +65 dB. After the gain amplifier, the Log Amp Firmware Assembly converts the 10.7 MHz signal to LOG VIDEO and sends it to the Analog Firmware Assembly. The amplified signal passes through the video filter to the Digitizer Firmware Assembly. The Digitizer converts the analog signal to digital at up to a 25 MHz rate and sends the data through the System Controller Firmware Assembly to the Video Controller Firmware Assembly, according to the sweep speed setting. The Video Controller Firmware Assembly processes the data for display on the CRT.

2-3-2 FREQUENCY SYNTHESIS

The Sampler Synthesizer Firmware, Sweep Synthesizer Firmware and YIG Synthesizer Assemblies provide the synthetic signals used for spectrum sweeping. The spectrum sweep begins at the Start Frequency. The sweeping YIG Frequency provides the correct LO signal across the spectrum for mixing with the input signal. The Sampler Output and Offset Frequencies are used to lock the YIG Oscillator.

A. START FREQUENCY (ST)

The Center Frequency (CF) and Frequency Span (FS) (full span across display) settings determine the Start Frequency (ST), the leftmost frequency displayed on the CRT. The Start Frequency settings also determine the lock frequency, the YIG Oscillator returns to after each sweep.

EQUATION: $ST = CF - 5\,Div \cdot \frac{FS}{Div} = CF - 5 \cdot FS$

EXAMPLES: Center Frequency of 112 MHz with Frequency Span of 200 kHz/Div.
ST=112 MHz - 5(200 kHz)=112 MHz -1 MHz=111 MHz

Center Frequency of 3200 MHz with Frequency Span of 100 MHz/Div.
ST=3200 MHz - 5(100 MHz) = 3200 MHz -500 MHz=2700 MHz

Center Frequency of 17 GHz with Frequency Span of 500 MHz/Div.
ST=17000 MHz - 5(500 MHz)=17000 MHz -2500 MHz=14.5 GHz

B. YIG FREQUENCY (YF)

Setting the Center Frequency and Frequency Span adjusts the Main Tune DAC in the YIG Synthesizer Firmware Assembly for a starting YIG Frequency within 15 MHz of the nearest 100 MHz. The YIG Synthesizer Firmware Assembly sends the YIG Frequency signal as the RF LO (A10A1J4) to the RF Receiver Assembly, the µWAVE LO (A10A1J5) to the Microwave Receiver Assembly and the AUX LO to the EXTERNAL MIXER LO Connector (W9J1/W10J1).

The Start Frequency (ST) and the operating band determine the YIG Frequency (YF). The Intermediate Frequency (IF) is the fixed result of the first conversion and varies according to operating band. H is the mixing harmonic of the LO signal from the YIG Synthesizer Assembly used in the conversion process. Refer to Table 2-2.

OPERATING BAND	FREQUENCY RANGE	H	IF
Band 0	0 to 2900 MHz	1	3610.7 MHz
Band 1	2600 to 12000 MHz	1	410.7 MHz
Band 2	≥11500 MHz	2	-410.7 MHz
External Mixer	≤1300 GHz	1 to 100	-410.7 or +410.7 MHz
NOTE: IF may vary, slightly, due to differences in filter tolerances.			

Table 2-2 YIG Frequency Equation Variables

The operating band for the overlapping frequencies between bands is determined by sweep width, current operating band and other system factors. Therefore, the operating band may vary for overlapping frequencies between bands. Multiple sweeps, required when sweeps go across two or more bands, are spliced together by the display routine. Band switching priorities are as follows:

- If total Frequency Span (Start and Stop) can be in one band, but not both, the band avoiding sweep splicing is used (e.g. 2.7 to 3.0 GHz uses Band 1.).
- If total Frequency Span (Start and Stop) can be in both bands, the current band or band closest to current band is used (e.g. 2.7 to 2.8 GHz).
- If sweep splicing is required, 2.8 and 12.0 GHz are the break points.

EQUATION: $$YF = \frac{ST + IF}{H}$$

EXAMPLES: ST=111 MHz, Operating Band is Band 0. (IF=3610.7 MHz, H=1)

$$YF = \frac{111\ MHz + 3610.7\ MHz}{1} = 3721.7\ MHz$$

ST=2700 MHz, Operating Band is Band 1 (could be Band 0, depending on circumstances). (IF=410.7 MHz, H=1)

$$YF = \frac{2700\ MHz + 410.7\ MHz}{1} = 3110.7\ MHz$$

ST=14.5 GHz, Operating Band is Band 2. (IF=-410.7 MHz, H=2)

$$YF = \frac{14500\ MHz + -410.7\ MHz}{2} = \frac{14089.3\ MHz}{2} = 7044.65\ MHz$$

C. SAMPLER OUTPUT FREQUENCY (SA)

The Sampler Output Frequency (101-107 MHz) from the Sampler Synthesizer Firmware Assembly (A3J3) locks the YIG Oscillator to the correct LO for the Start Frequency. Two major variables determine the Sampler Output Frequency, the YIG N (YN) and the 100 to 199.75 MHz VCO Frequency (VF). The Sampler Synthesizer Firmware Assembly uses the YIG N (YN) referenced to 1 MHz, in the ÷N circuit. The YIG Frequency (YF) and VCO Harmonic (VH) determine the processor controlled YIG N (YN) from 29 to 64. If the YIG Frequency is <6602 MHz, the YIG Synthesizer Assembly uses the fundamental VCO Frequency (VH=1) to tune the YIG Oscillator within 250 kHz. If the YIG Frequency is ≥6602 MHz, the YIG Synthesizer Assembly uses the second harmonic of the VCO Frequency (VH=2) to tune the YIG Oscillator within 500 kHz.

EQUATIONS: $$YN = \lfloor \left[\frac{YF - 2 - (100 \cdot VH)}{100 \cdot VH} \right]$$

$$VF = 0.25 \cdot \lfloor \left\{ [(YF - 2) - (100 \cdot YN \cdot VH)] \cdot \frac{4}{VH} \right\}$$

$$SA = 100 + \frac{VF}{YN}$$

NOTE: The $\lfloor$ symbol represents the floor function (integer [int] or truncated [trunc] value).

EXAMPLES:

YF=3721.7 MHz

$$YN = \lfloor \left[\frac{3721.7\ \text{MHz} - 2 - (100 \cdot 1)}{100 \cdot 1} \right] = \lfloor \frac{3619.7\ \text{MHz}}{100} = \lfloor 36.197 = 36$$

$$VF = 0.25 \cdot \lfloor \left\{ [(3721.7\ \text{MHz} - 2) - (100 \cdot 36 \cdot 1)] \cdot \frac{4}{1} \right\} = 0.25 \cdot \lfloor (119.7\ \text{MHz} \cdot 4)$$

$$= 0.25 \cdot \lfloor 478.8\ \text{MHz} = 0.25 \cdot 478\ \text{MHz} = 118.8\ \text{MHz}$$

$$SA = 100 + \frac{118.8\ \text{MHz}}{36} = 100 + 3.3\ \text{MHz} = 103.3\ \text{MHz}$$

YF=3110.7 MHz

$$YN = \lfloor \left[\frac{3110.7\ \text{MHz} - 2 - (100 \cdot 1)}{100 \cdot 1} \right] = \lfloor \frac{3008.7\ \text{MHz}}{100} = \lfloor 30.087 = 30$$

$$VF = 0.25 \cdot \lfloor \left\{ [(3110.7\ \text{MHz} - 2) - (100 \cdot 30 \cdot 1)] \cdot \frac{4}{1} \right\} = 0.25 \cdot \lfloor (108.7\ \text{MHz} \cdot 4)$$

$$= 0.25 \cdot \lfloor 434.8\ \text{MHz} = 0.25 \cdot 434\ \text{MHz} = 108.5\ \text{MHz}$$

$$SA = 100 + \frac{118.8\ \text{MHz}}{36} = 100 + 3.3\ \text{MHz} = 103.3\ \text{MHz}$$

YF=7044.65 MHz

$$YN = \lfloor \left[\frac{7044.65\ \text{MHz} - 2 - (100 \cdot 2)}{100 \cdot 2} \right] = \lfloor \frac{6842.65\ \text{MHz}}{200} = \lfloor 34.21325 = 34$$

$$VF = 0.25 \cdot \lfloor \left\{ [(7044.65\ \text{MHz} - 2) - (100 \cdot 34 \cdot 2)] \cdot \frac{4}{2} \right\} = 0.25 \cdot \lfloor (242.65\ \text{MHz} \cdot 2)$$

$$= 0.25 \cdot \lfloor 485.3\ \text{MHz} = 0.25 \cdot 485\ \text{MHz} = 121.25\ \text{MHz}$$

$$SA = 100 + \frac{121.25\ \text{MHz}}{34} = 100 + 3.566176\ \text{MHz} = 103.566176\ \text{MHz}$$

D. OFFSET FREQUENCY (OF)

The Offset Frequency (2-2.5 MHz) from the Sweep Synthesizer Firmware Assembly (A13J1) locks the YIG Oscillator to within 25 Hz of the Start Frequency LO.

EQUATION:

$$OF = 2 + \left\{ 0.25 \cdot VH \cdot \left[\left(\frac{4 \cdot YF}{VH} \right) - \lfloor \left(\frac{4 \cdot YF}{VH} \right) \right] \right\}$$

EXAMPLES:

YF=3721.7 MHz

$$OF = 2 + \left\{ 0.25 \cdot 1 \cdot \left[\left(\frac{4 \cdot 3721.7\ MHz}{1} \right) - \lfloor \left(\frac{4 \cdot 3721.7\ MHz}{1} \right) \right] \right\}$$

$$= 2 + [0.25 \cdot (14886.8\ MHz - \lfloor 14886.8\ MHz] = 2 + (0.25 \cdot 0.8\ MHz)$$

$$= 2.2\ MHz$$

YF=3110.7 MHz

$$OF = 2 + \left\{ 0.25 \cdot 1 \cdot \left[\left(\frac{4 \cdot 3110.7\ MHz}{1} \right) - \lfloor \left(\frac{4 \cdot 3110.7\ MHz}{1} \right) \right] \right\}$$

$$= 2 + [0.25 \cdot (12442.8\ MHz - \lfloor 12442.8\ MHz] = 2 + (0.25 \cdot 0.8\ MHz)$$

$$= 2.2\ MHz$$

YF=7044.65 MHz

$$OF = 2 + \left\{ 0.25 \cdot 2 \cdot \left[\left(\frac{4 \cdot 7044.65\ MHz}{2} \right) - \lfloor \left(\frac{4 \cdot 7044.65\ MHz}{2} \right) \right] \right\}$$

$$= 2 + [0.5 \cdot (28178.6\ MHz - \lfloor 28178.6\ MHz = 2 + (0.5 \cdot 0.6\ MHz)$$

$$= 2.3\ MHz$$

2-3-3 FFT

A. TERMS

Alias: False signal resulting from the property of any sampled system to observe any signal > 1/2 the sampling frequency, as the difference between that signal and any multiple of the sampling frequency.

Fourier Transform: Mathematical method of converting a continuous voltage versus time function into a voltage versus frequency function.

Discrete Fourier Transform (DFT): Method of numerically performing the Fourier Transform on discrete samples instead of a continuous function.

Fast Fourier Transform (FFT): Optimized algorithm for performing the DFT. FFT uses samples to powers of two and eliminates common inner terms in the computation. The number of computations required becomes proportional to approximately 1.2 times the number of samples instead of the number of samples squared.

B. THEORY

1. FFT Operation Through ANALYZER INPUT Connector (A9J1)

The input signal goes through the normal Spectrum Analyzer operation to the Log Amp Firmware Assembly, according to 2-3-1. For FFT, the IF signal is down converted again to an audio range IF. The Digitizer Firmware Assembly digitizes the IF with a 16-bit digitizer. The digitizing process preserves the frequency and amplitude information of the entire input signal. The System Controller Firmware Assembly processes the digitized signal using the FFT algorithm to provide a display equivalent to the display obtained at wider bandwidths using regular analog RF methods.

The IF Bandwidth Standard PC Board Assembly filters, providing alias protection for the digitizing process, determine the maximum display span and IF. The 10.7 MHz IF, going through the 3 kHz wide IF filter, is converted to 4 kHz (usable ±1 kHz) and sampled at a 50 kHz rate to produce a 200 Hz/Div Frequency Span. The FFT results, from 3 to 5 kHz, are displayed on the CRT as the desired spectrum. The 10.7 MHz IF, going through the 300 Hz wide IF filter, is converted to 1 kHz (usable ±100 Hz) and sampled at a 12.5 kHz rate to produce a 20 Hz/Div Frequency Span. The FFT results, from 900 to 1100 Hz, are displayed on the CRT as the desired spectrum.

2.. FFT Operation Through EXTERNAL INPUT Connector (A12J2)

When using the EXTERNAL INPUT Connector in FFT mode, the audio input signal goes through the Front Panel and Analog Firmware Assemblies to the Digitizer Firmware Assembly for digitizing. The System Controller Firmware Assembly processes the digital signal to simulate narrow RBW filtering. Refer to Table 2-2 for FFT equivalent bandwidths. The Video Controller Firmware Assembly receives the signal and provides a display in the frequency domain on the CRT Assembly. Input signals should be limited to ≤1/2 the sample rate to prevent aliasing.

NOTE: Anti-aliasing filters are not provided when using the EXTERNAL INPUT Connector. Some signals may require external filters for optimum display.

RESOLUTION	BIN WIDTH	SAMPLE RATE	FFT SIZE	DISPLAY SPAN	AUDIO INPUT (IF)
3 Hz	3.05	12.5 kHz	512 point	≤200 Hz	≤3 kHz
10 Hz	12.2	12.5 kHz	1024 point	≤200 Hz	≤3 kHz
		50.0 kHz	512 point	≤2 kHz	≤24 kHz
30 Hz	24.4	50.0 kHz	2048 point	≤2 kHz	≤24 kHz
100 Hz	48.8	50.0 kHz	2048 point	≤2 kHz	≤24 kHz

Table 2-3 FFT Equivalent Bandwidths

C. WINDOWS

WINDOW	EQUATION
UNIFORM	$w(n) = 1.0\ n$
BARTLETT	$w(n) = \frac{2n}{N-1}$ For $0 \le n \le N-1$ or $w(n) = 2 - \frac{2n}{N-1}$ For $\frac{N-1}{2} \le n \le N-1$
BLACKMAN	$w(n) = 0.42 - 0.5\cos\frac{2\pi n}{N-1} + 0.08\cos\frac{4\pi n}{N-1}$
BLACKMAN-HARRIS	$w(n) = 0.40217 - 0.49703\cos\frac{2\pi n}{N-1} + 0.09392\cos\frac{4\pi n}{N-1} - 0.00183\cos\frac{6\pi n}{N-1}$
HAMMING	$w(n) = 0.54 - 0.46\cos\frac{2\pi n}{N-1}$
HANN	$w(n) = 0.5\,(1 - \cos\frac{2\pi n}{N-1})$
NUTTALL	$w(n) = 0.3635819 - 0.4891775\cos\frac{2\pi n}{N-1} + 0.1365995\cos\frac{4\pi n}{N-1} - 0.0106411\cos\frac{6\pi n}{N-1}$
N=Total Number of Samples, n=Display Point	

Table 2-4 FFT Data Window Equations

WINDOW	RESOLUTION BANDWIDTH (Hz)	EQUIVALENT NOISE BAND-WIDTH (BINS)	3.0 dB BANDWIDTH (BINS)	6.0 dB BANDWIDTH (BINS)
UNIFORM	3	3.05	2.71	3.69
	10	12.2	10.9	14.8
	30	24.4	21.7	29.5
	100	48.8	43.4	59.0
BARTLETT	3	4.06	3.90	5.43
	10	16.2	15.6	21.7
	30	32.5	31.2	43.4
	100	64.9	62.5	86.9
BLACKMAN	3	5.28	5.10	7.17
	10	21.1	20.5	28.7
	30	42.2	41.0	57.3
	100	84.4	82.0	115.0
BLACKMAN-HARRIS	3	5.46	5.30	7.44
	10	21.8	21.2	29.8
	30	43.7	42.5	59.5
	100	87.4	84.9	119.0
HAMMING	3	4.15	3.97	5.52
	10	16.6	15.9	22.1
	30	33.2	31.7	44.2
	100	66.4	63.4	88.3
HANN	3	4.56	4.39	6.10
	10	18.3	17.6	24.4
	30	36.6	35.1	48.8
	100	73.2	70.2	97.6

Table 2-5 Data Windows

2-3-4 EXTERNAL MIXER

The External Mixer function uses harmonics from the 3 to 12 GHz LO signal and a compatible external mixer to analyze signals with frequencies of up to 1300 GHz.

The YIG Synthesizer provides the LO frequency (0 to 100th harmonic taken from the 3 to 12 GHz signal) for the external mixer at the EXTERNAL MIXER LO Connector (W9J1/W10J1). The external mixer sends a 410.7 MHz IF signal through the EXTERNAL MIXER IF Connector (W6J1) for any input signal within the selected bandwidth. The 410 MHz IF Firmware Assembly receives the 410.7 MHz signal and continues the Spectrum Analyzer process according to 2-3-1.

Correct system settings (Center Frequency, LO Harmonic, RF Attenuation, RBW) from front panel operation or remote commands are processed by the System Controller Firmware Assembly and allow the unit to display an accurate representation of the original input signal.

2-3-5 AM/FM RECEIVER

The unit receives AM/FM signals through the ANALYZER INPUT Connector (A9J1) or EXT MIXER IF Connector (W6J1). Wideband or narrow band detection operates as selected. The 410 MHz Firmware Assembly provides wideband (10 or 30 MHz RBW) detection. The Analog Firmware Assembly provides the narrow band (≤5 MHz RBW) detection.

NOTE: Wideband AM or FM uses the 410.7 MHz WIDEBAND VIDEO signal from the 410 MHz Firmware Assembly. The AM/FM Receiver mode screen displays wideband FM with the User-Defined demodulation mode selected, RBW set to 10 or 30 MHz RBW and frequency deviation set to ≥200 kHz/Div. (Wideband AM is only displayed in normal Spectrum Analyzer modes with a 10 or 30 MHz RBW.) User-Defined demodulation modes with an RBW ≤5 MHz or predefined demodulation modes use the 10.7 MHz signal, detected in the Analog Firmware Assembly. AM2 (wideband AM demodulation mode) with a 30 kHz RBW and FM2 (wideband FM demodulation mode) with a 300 kHz RBW are termed wideband only in reference to AM1 (narrow band AM demodulation mode) with 3 kHz RBW and FM1 (narrow band FM demodulation mode) with a 30 kHz RBW, respectively.

The unit receives the AM/FM signal (RBW ≤5 MHz) the same way as with the Spectrum Analyzer (2-3-1) or External Mixer (2-3-4), to the 410 MHz Firmware Assembly 10.7 MHz output (A14J5). The IF Bandwidth Option PC Board Assembly, if installed, or the IF Bandwidth Standard PC Board Assembly provides the RBW filtering, as selected according to predefined demodulation modes or RBW setting. For AM1, the signal passes through the 3 kHz filter. For AM2 or FM1, the signal passes through the 30 kHz filter. For FM2, the signal passes through the 300 kHz filter. The 10.7 MHz signal is sent to the Log Amp Firmware Assembly. The Log Amp Firmware Assembly drives the 10.7 MHz signal through the auxiliary output (A16J1) to the Analog Firmware Assembly. The Analog Firmware Assembly detects the AM and/or FM. According to the selected demodulation mode, the Analog Firmware Assembly filters the detected video signal. For AM1 or FM1, the signal passes through the 3 kHz video filter. For AM2 or FM2, the signal passes through the 10 kHz video filter. The Analog Firmware Assembly send the filtered video signal out (A18J3) to the Digitizer Firmware Assembly. The System Controller Firmware Assembly processes the digitized signal. The Video Controller Firmware Assembly displays the processed signal on the CRT Assembly. The Analog Firmware Assembly provides the audio signal through the Front Panel (Keyboard) Controller to the speaker. The Front Panel (Keyboard) Controller processes squelch control information from the Front Panel Assembly (SQUELCH Control) or remote commands to provide Squelch Control in the Analog Firmware Assembly.

2-3-6 FREQUENCY COUNTER

The unit receives the Frequency Counter signal the same way as with the AM/FM receiver to the Analog Firmware Assembly. The Analog Firmware Assembly converts the 10.7 MHz auxiliary output signal from the Log Amp Firmware Assembly to a buffered logic signal applied to an internal counter. The internal counter divides the 1 MHz reference from the Frequency Reference Firmware Assembly to provide resolution down to 1 Hz. The System Controller Firmware Assembly reads the counter output from the Analog Firmware Assembly to provide information for the Video Controller Firmware Assembly to display on the CRT Assembly.

2-3-7 OSCILLOSCOPE

Control settings to the System Controller Firmware Assembly processor set up the unit for Digital Oscilloscope operation. Processed information from the System Controller to the Front Panel Assembly set input coupling and amplitude scaling for unit operation through the EXTERNAL INPUT Connector (A12J2). Input coupling is set to ac, dc or ground. Amplitude scaling through compensated attenuators provides a usable output (A12A4J2) level to the Analog Firmware Assembly. The Analog Firmware Assembly sets vertical position according to control settings through the System Controller Firmware Assembly. The Digitizer Firmware Assembly converts the analog signal to digital. The Video Controller Firmware displays the signal on the CRT Assembly.

2-3-8 VIDEO OPERATION

The Video Controller Firmware Assembly controls video operation. The System Controller Firmware Assembly passes data to the Video Controller Firmware Assembly through the NAT-BUS. The Video Controller Firmware Assembly accumulates the video data in video RAM, processes the data and passes appropriate analog signals to the CRT Assembly. The CRT is a monochrome EGA monitor. Full color capabilities are available at the EXT DISPLAY Connector (W47J1) for an external EGA monitor.

Logarithmic, Linear and Enhanced Logarithmic display modes are initiated by remote commands or front panel operation. The Log Amp Firmware Assembly converts the Spectrum Analyzer signal to a dc voltage relative to the Linear or Logarithmic display mode reference. The Analog Firmware Assembly passes the selected video information to the Digitizer Firmware Assembly. The Digitizer digitizes the analog video information at a 25 MHz rate for the System Controller Firmware Assembly. The System Controller Firmware Assembly provides the appropriate control and signal data for the Video Controller Firmware Assembly.

For Enhanced Logarithmic display mode, two signal samples are taken for each CRT display to provide the 120 dB dynamic range. The first sweep sample provides the bottom 2/3 (80 dB) of the CRT display. After the first sweep sample, the System Controller Firmware Assembly adjusts the attenuation in the Microwave Receiver Assembly and/or the gain in the IF Bandwidth Standard PC Board Assembly and the Log Amp Firmware Assembly (if required) to provide the extra 40 dB of range. The second sweep sample provides the top 1/3 (40 dB) of the CRT display. The Digitizer uses a 16-bit digitizer at a 100 kHz rate to digitize the analog samples. The System Controller Firmware Assembly processes the data for the Video Controller Firmware Assembly to display both sweep samples together on the CRT Assembly.

2-3-9 REMOTE OPERATION

Remote operation is possible through the RS-232 Connector (W39J2) or IEEE-488 GPIB Connector (W39J1) on the rear panel. RS-232 operation uses a serial format. GPIB operation uses a parallel format. The System Controller Firmware Assembly contains all the interfacing and control circuits for RS-232 or GPIB operation.

2-4 MODULE THEORY OF OPERATION

2-4-1 GENERAL

The information in this section provides the maintenance technician with information about the operation of each specific assembly. Information provided is functional level only. Block diagrams outline function and not type, quantity or location of components. Listings of pin numbers of signals are provide with block diagrams to aid the technician in tracing signals in and out of the assembly. Additional supporting drawings are available in Section 7.

Assembly theories are listed by paragraph and page location as follows:

PARAGRAPH	TITLE	PAGE
2-4-2	POWER SUPPLY ASSEMBLY	2-18
2-4-3	SYSTEM CONTROLLER FIRMWARE ASSEMBLY	2-21
2-4-4	FREQUENCY REFERENCE FIRMWARE ASSEMBLY	2-25
2-4-5	SAMPLER SYNTHESIZER FIRMWARE ASSEMBLY	2-27
2-4-6	SWEEP SYNTHESIZER FIRMWARE ASSEMBLY	2-29
2-4-7	YIG SYNTHESIZER ASSEMBLY	2-33
2-4-8	MICROWAVE RECEIVER OR ATTENUATOR ASSEMBLY	2-35
2-4-9	RF RECEIVER ASSEMBLY	2-37
2-4-10	410 MHz IF FIRMWARE ASSEMBLY	2-39
2-4-11	IF BANDWIDTH STANDARD PC BOARD ASSEMBLY	2-41
2-4-12	IF BANDWIDTH OPTION PC BOARD ASSEMBLY	2-43
2-4-13	LOG AMP FIRMWARE ASSEMBLY	2-45
2-4-14	ANALOG FIRMWARE ASSEMBLY	2-49
2-4-15	FRONT PANEL ASSEMBLY	2-53
2-4-16	DIGITIZER FIRMWARE ASSEMBLY	2-57
2-4-17	VIDEO CONTROLLER FIRMWARE ASSEMBLY	2-59
2-4-18	CRT ASSEMBLY	2-60
2-4-19	TRACKING GENERATOR ASSEMBLY (OPTION 02)	2-60

2-4-2 POWER SUPPLY ASSEMBLY

The Power Supply Assembly converts any one of three voltage inputs to the dc voltages used in the unit. All voltages are regulated and filtered to remove ripple from the final output. The Power Supply Assembly provides up to 120 watts of continuous power or 150 watts intermittent (1 minute maximum/1% maximum duty cycle).

- For normal ac operation, the unit requires 85 to 135 VAC, when the AC VOLTAGE SELECT Control is set to ***110***, or 170 to 265 VAC, when the AC VOLTAGE SELECT Control is set to ***220***, applied at the AC IN Connector (A6J6). The ac voltage frequency must be between 50 to 400 Hz and have up to 300 watts power capability.

  The Power Supply Assembly filters incoming ac for EMI. Two 5.0 A (110 V operation) or 2.5 A (220 V operation) ac line fuses provide current protection. The MAIN POWER CUTOFF Switch allows current flow through the power transformer. The AC VOLTAGE SELECT Control sets the two primary windings of the power transformer in parallel for 110 V operation or series for 220 V operation. The output sets a voltage on the POWER APPLIED line (pin 1 of A6J5) to activate the POWER APPLIED Indicator on the Front Panel Assembly. The Power Supply Assembly also sends out a logic level LINE TRIGGER (pin 7 of A6J5) to the Analog Firmware Assembly as an available trigger source selection. The Power Supply Assembly rectifies the ac signal for the switcher (converting) circuits to provide the various required dc voltages.

- For battery operation, the accessory Battery Pack (AC7244) applies 12 Vdc (10 A/Hr capabilities) to the BAT IN Connector (pins 3 and 4 of A6J7).

  The Power Supply Assembly filters the battery input for EMI and unwanted ac. The Front Panel Assembly monitors battery voltage from the BATTERY line (pin 4 of A6J5). A sensing circuit, verifying ac power is not connected and the battery power is, operates a battery control relay to connect the battery to the switcher circuits.

  When battery voltage falls below 10.4 V, the Power Supply Assembly automatically shuts down.

  When ac or external dc power is connected, the battery charging circuit applies 10.5 to 14.0 Vdc at 0 to 1.5 A through pin 4 or A6J7, to the positive terminal of the BAT IN Connector.

- For dc operation, an external dc power source applies 11 to 30 Vdc (≤15 A at 12 V) to the EXT DC IN Connector (pins 1 and 2 of A6J7).

  The Power Supply Assembly filters incoming dc for EMI and unwanted ac. The 20 A, 32 Vdc EXT DC Fuse provides current protection. A sensing circuit, verifying ac power is not connected and dc power is, operates a dc control relay to connect the dc to the switcher circuits. The dc input also sets a voltage on the POWER APPLIED line (pin 1 of A6J5) to activate the POWER APPLIED Indicator on the Front Panel Assembly.

  When external dc voltage falls below 10.4 V, the Power Supply Assembly automatically shuts down.

The Power Supply Assembly provides the following output voltages:

- +35 V (pin 3 of A6J1)
- +12 V SWEEP (pins 10 and 22 of A6J1)
- +12 V (pins 9 and 21 of A6J1)
- +12 V aud/CRT (pins 2 and 14 of A6J1)
- +5 V (Analog) (pin 4 of A6J1)
- +5 V (Digital) (pins 12 and 24 of A6J1)
- -12 V (pins 7 and 19 of A6J1)
- +12 V (Oven) (pin 1 of A6J3)

A ground (pin 3 of A6J5) from the POWER Switch on the Front Panel Assembly activates the Power Supply Assembly. All output voltages are subject to the POWER Switch on the Front Panel Assembly except the +12 V (Oven) source. The +12 V (Oven) source continuously operates anytime ac or external dc is connected. The +12 V (Oven) source provides the voltage necessary to run the Medium or High Stability Time Base (internal Frequency Standard). The battery charging circuit also uses the +12 V (Oven) source.

A low TTL signal on the normally high PS SHUTDOWN line from the System Controller Firmware Assembly (pin 2 of A6J5), deactivates the Power Supply Assembly. When pressing the POWER Switch Off or a low voltage condition exists or a high temperature condition exists, the System Controller Firmware Assembly has current settings recorded and a low is sent out on the PS SHUTDOWN line.

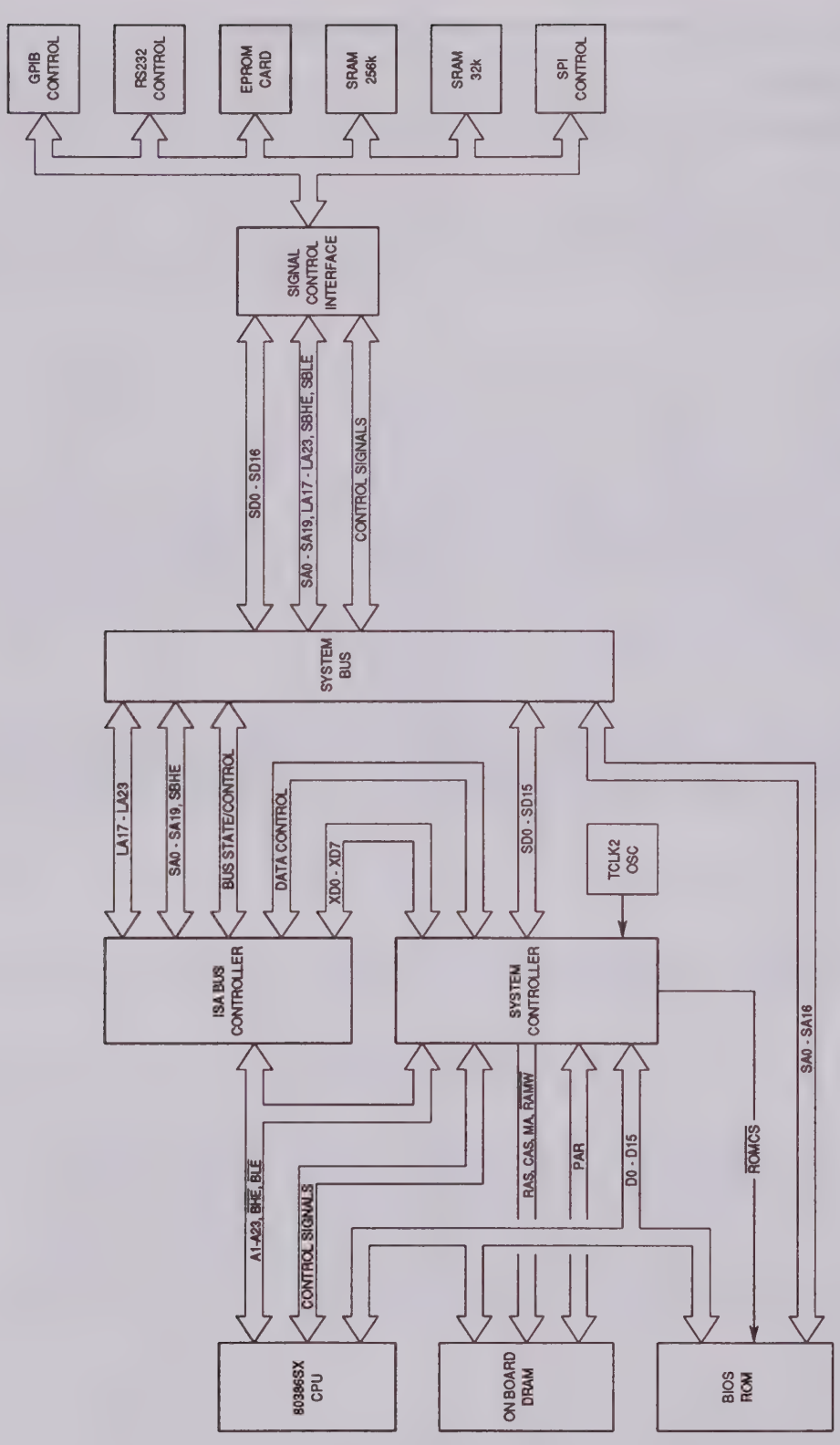


Figure 2-3 System Controller Firmware Assembly Block Diagram

2-4-3 SYSTEM CONTROLLER FIRMWARE ASSEMBLY

The System Controller Firmware Assembly controls the unit system functions. The CPU is an Intel 80386SX embedded microcontroller. The 80386SX CPU, a 32-bit processor, has a 24-bit address bus and 16-bit data bus. The System Controller and ISA Bus Controller speed up the system processes by handling bus operations. The System Controller provides the top level control interface between the synchronous local and memory data bus and the asynchronous slot data bus. The CPU controls Dynamic RAM through the System Controller. The ISA Bus Controller controls the I/O Channel and supervises Direct Memory Access (DMA), Interrupt Requests and Acknowledges. Refer to Table 2-6 for the signals on the I/O Channel NAT BUS. The ISA Bus Controller also contains the real time clock set in the Real Time Clock Set Screen.

A XILINX Logic Cell Array with external buffers provide the Signal Control Interface between the System Bus and the GPIB Control, RS232 Control, EPROM Card, SRAM 256k, NV SRAM 32k, and Serial Peripheral Interface (SPI) Control. Refer to Table 2-7 for Slave Select signal destinations. Additional controller circuits are:

- MAX690 Supervisory Circuit controls power-up RESET and Nonmaskable Interrupt actions. RESET affects the CPU, System Controller, ISA Bus Controller, Signal Control Interface and other I/O Devices. The RESET signal from the MAX690 becomes the RSTDRV signal on the NAT-BUS.

- Memory Select Circuit controls what section of memory is being used.

The System Controller Firmware Assembly contains memory as follows:

- Four 256k X 8 ON BOARD DRAM modules (current operation settings)

- Two 64k X 8 BIOS ROM ICs (system code)

- EPROM Card (software control)

- Two 128k X 8 SRAM ICs (standard expanded user memory) (Option 06 for AN930)

- One 32k X 8 NV SRAM IC (resident user memory)

The RAM is used for storing program global parameters.

The modified IBM AT™ Compatible I/O Channel (NAT-BUS) contains:

- 16-bit bidirectional data bus

- 24-bit address line bus

- 11 levels of interrupt (7 currently used)

- Memory and I/O Read/Write lines

- Clock and timing lines

- 5 channels of DMA control lines (3 currently used)

- Memory refresh timing control line

Table 2-6 lists NAT-BUS signals with respective functions.

SIGNAL	I/O	DESCRIPTION
SYSCLK	O	8 MHz System Clock sent to Motherboard PC Board Assembly. Divide-by-four of clock crystal.
RSTDRV	O	Resets system logic at power-up or low voltage. Active high on falling edge of clock.
SA0-SA19	O	Address bits 0 to 19. Active high address lines address memory and I/O devices. SA0 is least significant bit (LSB) and SA19 is most significant bit (MSB). Generated by ISA Bus Controller.
SD0-SD15	I/O	Data bits 0 to 15. Active high data lines provide data bits 0 to 15 for data bus. D0 is least significant bit (LSB) and D15 is most significant bit (MSB). Generated by System Controller.
BALE	O	Bus Address Latch Enable. Provided by AT compatible signal generator and used within System Controller Firmware Assembly to latch address. Available to I/O channel as indicator of valid processor address (when used with AEN).
IOCHRDY	I	I/O Channel Ready. Pulled low (not ready) by memory or I/O device to lengthen I/O or memory cycles. Allows slower devices to attach to I/O channel. User devices set IOCHRDY line low upon detecting valid address and read or write command.
IRQ3-IRQ7 IRQ9-IRQ12 IRQ14-IRQ15	I	Interrupt Request Lines 3 to 7, 9 to 12 and 14 to 15. Active high signal informs CPU, an I/O device requires attention. IRQ3, IRQ9, IRQ12 and IRQ14 are not used at this time. Priorities in descending order are IRQ15 (FREQ-HOST) from Frequency Reference Firmware Assembly, IRQ10 from Digitizer Firmware Assembly, IRQ11 (HOST-IRQ) from Front Panel Assembly, IRQ4 from Video Controller Firmware Assembly, IRQ5 from on board LCA, IRQ6 (IRQ-SER) from FUNCTION Connector (W40J1) and IRQ7 from on board LCA. Line remains high until acknowledged by CPU.
$\overline{\text{IOR}}$	O	I/O Read Command. Active low signal instructs I/O device to put data on data bus.
$\overline{\text{IOW}}$	O	I/O Write Command. Active low signal instructs I/O device to read data from data bus.
$\overline{\text{MEMR}}$	O	Memory Read Command. Active low signal instructs memory to put data on data bus.
$\overline{\text{MEMW}}$	O	Memory write command. Active low signal instructs memory to store data on data bus.

Table 2-6 NAT-BUS Signals

SIGNAL	I/O	DESCRIPTION
DRQ0-DRQ1 DRQ3 DRQ5-DRQ6	I	DMA Request lines. Asynchronous channel request lines used by peripheral devices to gain DMA service. DRQ3, DRQ5 and DRQ6 are not used at this time. Priorities in descending order are DRQ1 from on board LCA and DRQ0 from Digitizer Firmware Assembly. Request is generated by bringing line high until corresponding DACK line is activated.
$\overline{\text{DACK0}}$-$\overline{\text{DACK1}}$ $\overline{\text{DACK3}}$, $\overline{\text{DACK5}}$-$\overline{\text{DACK6}}$	O	DMA Acknowledge lines. Lines acknowledge corresponding DMA request from peripheral devices. $\overline{\text{DACK3}}$ and $\overline{\text{DACK5}}$ are not used at this time. CPU controls $\overline{\text{DACK6}}$ for write only (data from memory) to Video Controller Firmware Assembly (no DMA request involved).
$\overline{\text{REFRESH}}$	O	Refreshes system dynamic memory.
AEN	O	Address Enable. Used to disconnect CPU and inactive devices during DMA transfers. Active high line causes ISA Bus Controller to control address bus, data bus, read commands and write commands for memory and I/O.
T/C	O	Terminal Count Pulse. Active high pulse indicates when terminal count is reached during DMA transfer.
$\overline{\text{SBHE}}$	I/O	Bus High Enable. Indicates transfer of data on high byte of data bus, SD8 to SD15.
$\overline{\text{MEMCS16}}$	I	Indicates present data transfer is 1 wait-state, 16-bit memory cycle.
LA17-LA23	I/O	Signals address system memory. Provides 16 megabytes of address capability. Signals are valid when BALE is high. Signals are not latched and may not be valid for entire cycle. Generated by CPU or other processors or DMA Controllers on the I/O Channel.
$\overline{\text{I/O CS16}}$	I	Active low signal indicates current data transfer is a 16-bit, 1 wait state I/O cycle.

Table 2-6 NAT-BUS Signals (continued)

LCA LINE	OFF BOARD LINE	DESTINATION
SLAVE1	$\overline{\text{SLAVE-SEL 0}}$	Front Panel Assembly
SLAVE2	$\overline{\text{SLAVE-SEL 1}}$	Frequency Reference Firmware Assembly
SLAVE3	$\overline{\text{SLAVE-SEL 2}}$	Sweep Synthesizer Firmware and RF Receiver Assemblies
SLAVE4	$\overline{\text{SLAVE-SEL 3}}$	Sampler Synthesizer Firmware and YIG Synthesizer Assemblies
SLAVE5	$\overline{\text{SLAVE-SEL 4}}$	410 MHz IF Firmware Assembly
SLAVE5	$\overline{\text{SLAVE-SEL 5}}$	Analog Firmware and Log Amp Firmware Assemblies
SLAVE7	$\overline{\text{SLAVE-SEL 6}}$	Tracking Generator Assembly
SLAVE8	$\overline{\text{SLAVE-SEL 7}}$	FUNCTION Connector (W40J1)

Table 2-7 Slave Select Signal Designations

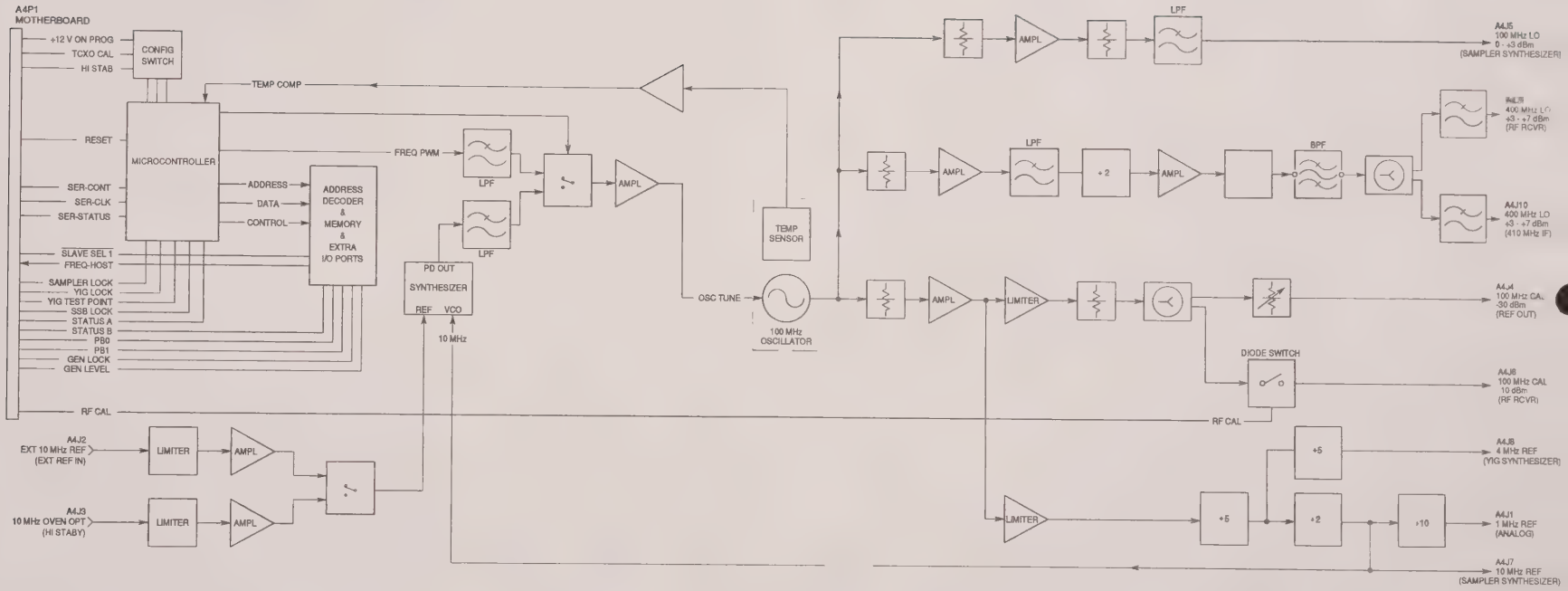


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Figure 2-4 Frequency Reference Firmware Assembly Block Diagram

2-4-4 FREQUENCY REFERENCE FIRMWARE ASSEMBLY

The Frequency Reference Firmware Assembly provides the following reference signals:

- 100 MHz (A4J4, A4J5 and A4J6)
- 400 MHz (A4J9 and A4J10)
- 1 MHz Logic (A4J1)
- 10 MHz Logic (A4J7)
- 4 MHz Logic (A4J8)

The Frequency Reference Firmware Assembly receives a 10 MHz reference frequency from an internal time base or external reference source, as selected in the Analyzer Configuration Screen Options Menu. The internal High Stability (Option 09) or Medium Stability Time Base applies the 10 MHz signal to A4J3. (Newer models have the 10 MHz reference standard internally on the Frequency Reference Firmware Assembly.) When connected to the EXT REF IN Connector and selected, an external reference source applies 10 MHz to A4J2.

References are taken from the 100 MHz crystal oscillator. The microcontroller keeps the oscillator tuned according to inputs from the temperature compensation circuit and the Phase Locked Loop (PLL). The PLL synthesizer compares the 10 MHz output with the 10 MHz frequency reference to keep the signal tuned and in phase.

The 50 Ω 100 MHz oscillator output splits, going through three separate 150 Ω attenuation pads (10 to 11 dB loss) providing high reverse isolation within the broadband. Each path has an amplifier circuit to convert the 150 Ω input to a 50 Ω output.

On one path, the signal passes through a low-pass filter to remove harmonics and becomes the 100 MHz LO signal for the Sampler Synthesizer Firmware Assembly. The output through A4J5 leaves the Frequency Reference Firmware Assembly at a 0 to +3 dBm level.

On another path, the signal also passes through a low-pass filter to remove harmonics. Two frequency doublers, with an amplifier to maintain proper signal levels, provide a 400 MHz reference signal. A bandpass filter removes harmonics and unwanted frequency products resulting from the multipliers. The output goes through a splitter to provide a 400 MHz reference signal at +3 to +7 dBm through A4J9 for the RF Receiver Assembly and A4J10 for the 410 MHz IF Firmware Assembly.

On the final path, the signal splits, going through two separate limiters providing accurate power levels over temperature. One signal splits again to provide two 100 MHz calibration signals. An adjustable resistor network maintains a -30 dBm (±0.25 dB) output level for the external 100 MHz calibration signal. The Frequency Reference Firmware Assembly sends the 100 MHz calibration signal through A4J4 to the REF OUT Connector (A12J1B-A12J1A) on the Front Panel Assembly and a software controlled internal 100 MHz calibration signal at ≈-10 dBm through A4J6 to the RF Receiver Assembly. The other final path signal goes through a divide by five circuit for a 20 MHz output. The 20 MHz signal splits two. One 20 MHz signal divides by five again to provide a 4 MHz LOGIC signal through A4J8 to the Sweep Synthesizer Firmware Assembly. The other 20 MHz signal divides by two and splits into three 10 MHz signals. One 10 MHz signal to the synthesizer (PLL) keeps the 100 MHz crystal oscillator tuned. Another 10 MHz signal divides by ten to provide the 1 MHz LOGIC signal through A4J1 to the Analog Firmware Assembly. The Frequency Reference Firmware Assembly sends the final 10 MHz LOGIC signal through A4J7 to the Sampler Synthesizer Assembly.

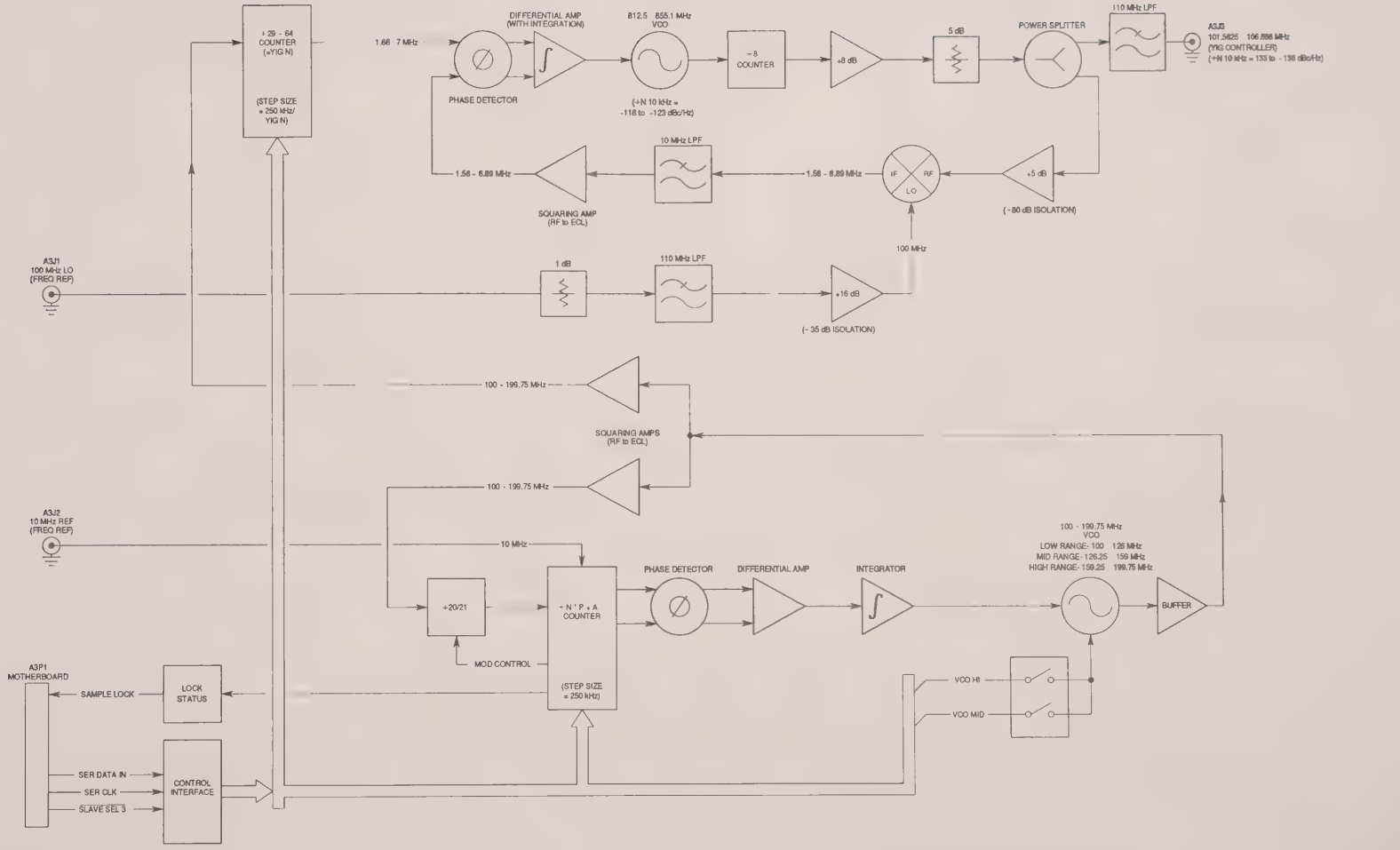

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Figure 2-5 Sampler Synthesizer Firmware Assembly Block Diagram

2-4-5 SAMPLER SYNTHESIZER FIRMWARE ASSEMBLY

The unit uses the Sampler Synthesizer Firmware Assembly to lock the YIG Oscillator, in the YIG Synthesizer Assembly, to the Start Frequency. The Sampler Synthesizer Firmware Assembly contains two looped synthesizer circuits. The first synthesizer circuit provides the 100 to 199.75 MHz signal for the final synthesizer circuit. The output synthesizer provides the 101.56 to 106.9 MHz signal through A3J3 to the YIG Synthesizer Assembly. The System Controller Firmware Assembly provides the control data (YIG N and VCO range control) to set both synthesizers for the correct output. Refer to 2-3-2 for frequency synthesis equations.

The first synthesizer uses the 10 MHz REF (LOGIC) signal from the Frequency Reference Firmware Assembly through A3J2. A counter divides the 10 MHz, according to control data, for 250 kHz steps (or 500 kHz steps if YIG Frequency is ≥6602 MHz). The internal phase detector (same IC as counter) provides signals through a differential amplifier and integrator to control the 100 to 199.75 MHz VCO along with the range control circuit. Switch circuits select one of three ranges according to the required YIG Frequency:

- Low Range (100 to 126 MHz)
- Mid Range (126.25 to 159 MHz)
- High Range (159.25 to 199.75 MHz)

The 100 to 199.75 MHz VCO output, split and squared, feeds the ÷20/21 Prescaler to complete the first synthesizer loop and the ÷5/6 Prescaler to the ÷YIG N counter in the output synthesizer circuit.

The ÷YIG N counter sends a 1.66 to 7 MHz input to the output synthesizer phase detector. Phase detector signals through a differential/integrating amplifier control a 812.5 to 855.1 MHz VCO. A ÷8 counter provides the 101.5625 to 106.888 MHz Sampler Synthesizer Firmware Assembly output frequency. After some level setting and filtering, the Sampler Synthesizer Firmware Assembly sends the signal through a power splitter and A3J3 to the YIG Synthesizer Assembly at 0 dBm (±2 dB). The other power splitter output starts the feedback loop through an amplifier driving the RF input to a mixer. The mixer uses the 100 MHz LO from the Frequency Reference Firmware Assembly through A3J1. The 1.56 to 6.89 MHz IF output, filtered and squared, completes the feedback loop to the phase detector.

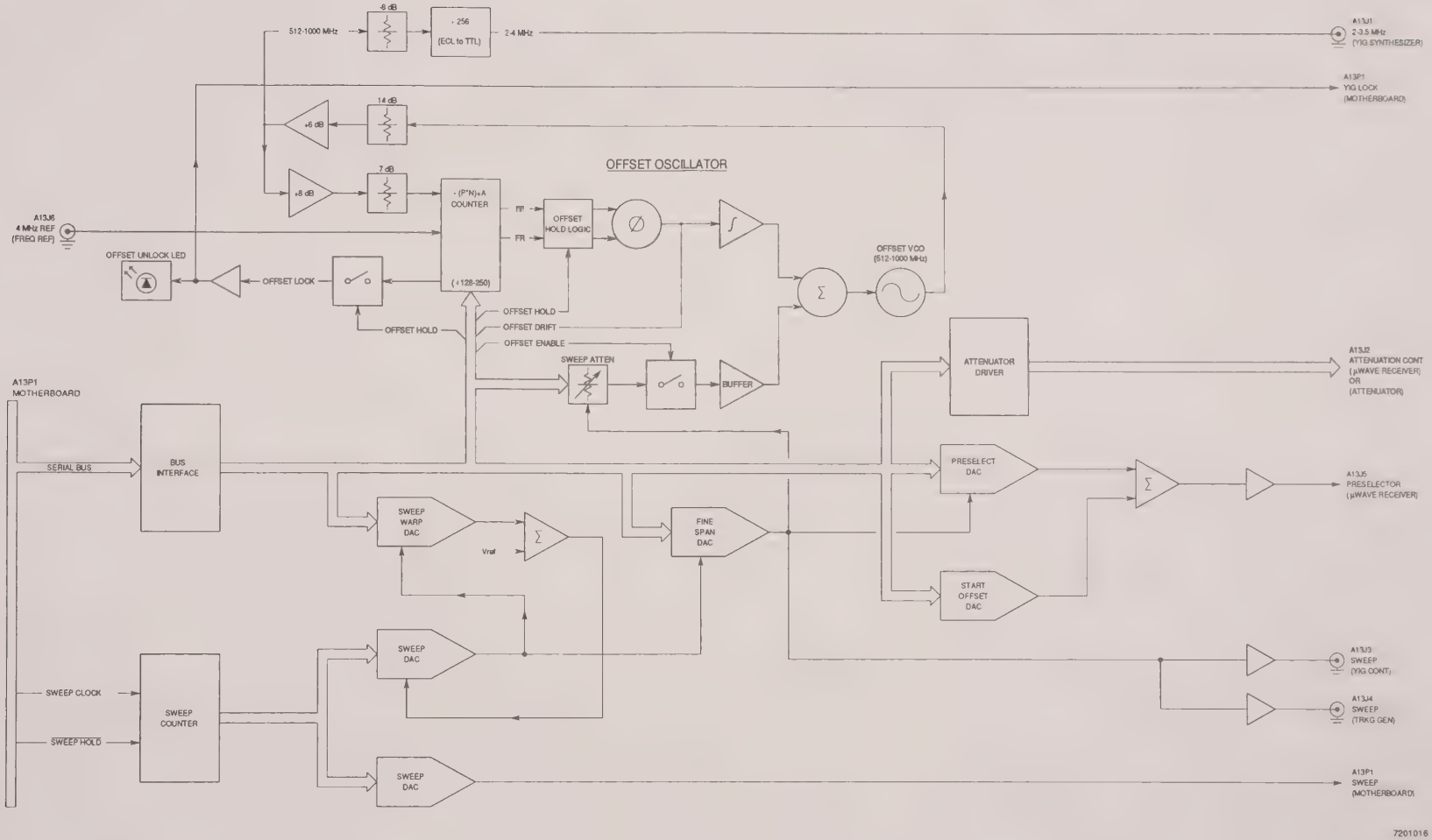

Figure 2-6 Sweep Synthesizer Firmware Assembly Block Diagram

2-4-6 SWEEP SYNTHESIZER FIRMWARE ASSEMBLY

The Sweep Synthesizer Firmware Assembly performs the following functions:

- Analog Sweep Generation

The ramp generator provides the sweep ramp signal used to control the YIG Oscillator. The Digitizer Firmware Assembly controls the sweep ramp with the SWEEP CLOCK and $\overline{\text{SWEEP HOLD}}$ signals to the Sweep Counter. SWEEP CLOCK provides 4000 counts (400 counts per division) at the rate set by the Digitizer according to Sweep Time settings. The Sweep Time rate ranges from 10 ms (1 ms/Div) to 100 s (10 s/Div). $\overline{\text{SWEEP HOLD}}$ goes high during a sweep and low to reset the Sweep Counter to zero. The Sweep DACs convert the digital sweep output from the Sweep Counter to analog. One linear analog sweep ramp signal is sent to the FUNCTION Connector, pin 14 (SWEEP). A warp DAC references and scales the main sweep ramp signal for an exponential output. The Fine Span DAC scales the signal to provide an approximate 10:1 sweep amplitude range for variable Frequency Span and Frequency Span calibration.

Four outputs are provided from the main sweep ramp. For two outputs, the Sweep Synthesizer Firmware Assembly buffers and sends sweep ramp signals, from 0.3 to 5 V_{P-P}, through A13J3 to the YIG Synthesizer and A13J4 to the Tracking Generator (Option 02), if installed. The main sweep ramp signal also feeds the Microwave Receiver Assembly interface and Offset Oscillator sections of the Sweep Synthesizer Firmware Assembly. The sweep ramp routing and amplitude (through the Fine Span DAC) are set according to the Frequency Span settings. Refer to Table 2-8.

FREQUENCY SPAN		SWEEP RAMP ROUTING	
TOTAL WIDTH	PER DIVISION	CIRCUIT	ASSEMBLY
≤1 MHz	≤100 kHz	Offset Oscillator	Sweep Synthesizer Firmware
>1 to ≤10 MHz	>100 kHz to ≤1 MHz	FM Tune Line/YIG Controller	YIG Synthesizer
>10 MHz	>1 MHz	Main Tune Line/YIG Controller	YIG Synthesizer

Table 2-8 Sweep Ramp Routing

- Microwave Receiver Assembly Interface

NOTE: The Attenuator Assembly replaces the Microwave Receiver Assembly in the AN920. For the AN920, only the Attenuator Driver applies.

The Microwave Receiver Assembly interface provides the preselector sweep signal to drive the YIG Filter in the Microwave Receiver Assembly. The Start Offset DAC tunes the preselector to the left edge (Start Frequency). The Preselect DAC provides decade scaling and calibration to match the preselector to the synthesizer sweep systems. The Preselect DAC is programmed according to Table 2-9. Both DACs are set to zero when operating in Band 0. With Band 1 selected, the unit operates using the fundamental YIG Frequency and the data value is divided by two before programming the Preselect DAC. With Band 2 selected, the unit operates using the second harmonic of the YIG Frequency, requiring the preselector to sweep twice as far as in Band 1 and the data value is programmed directly into the Preselect DAC. The Start Offset DAC and Preselect DAC output voltages are summed together in the voltage to current converter. The high current output, through A13J5, pin 4 (PRESELECTOR TUNE +), drives the YIG Filter in the Microwave Receiver Assembly.

SWEEP RANGE	BAND 1 PROGRAMMING	BAND 2 PROGRAMMING
10 GHz	2000	4000
1 GHz	200	400
100 MHz	20	40
10 MHz	2	4

Table 2-9 Preselect DAC Programming

The Sweep Synthesizer Firmware Assembly also controls the 0 to 60 dB Attenuation in the Microwave Receiver Assembly (AN930, AN930A and AN940) or Attenuator Assembly (AN920). The Attenuator Driver controls the Step Attenuator in the Microwave Receiver Assembly or Attenuator Assembly, through A13J2. Settings for internal attenuation determine the active control data.

The Sweep Synthesizer Firmware Assembly converts the band switching control, from the RF Receiver Assembly on the µWAVE IF SEL line, to the appropriate voltage level for the Microwave Receiver Assembly. A high on the µWAVE IF SEL line applies +10 volts (5 mA) through A13J5, pin 6 (IF BAND SEL) to select the Band 1 Mixer in the Microwave Receiver Assembly. A low on the µWAVE IF SEL line applies -10 volts (5 mA) through A13J5, pin 6 (IF BAND SEL) to select the Band 2 Mixer in the Microwave Receiver Assembly.

- Offset Oscillator

The Offset Oscillator provides the 25 Hz tuning steps (for setting the Start Frequency) and the sweep control for Frequency Spans ≤1 MHz (≤100 kHz/Div) wide. The Offset Oscillator output through A13J1 ranges from 2.0 to 3.5 MHz at TTL levels. The YIG Synthesizer Assembly uses 2.0 to 2.5 MHz Offset Frequency to lock the Start Frequency within 25 Hz. Refer to 2-3-2 to calculate the Offset Frequency. Sweep control to the YIG Synthesizer Assembly uses the sweep ramp signal to provide an output ranging from the Offset Frequency to 1 MHz + the Offset Frequency, according to Frequency Span settings.

The reference divider, part of the ÷(P•N)+A Counter, converts the 4 MHz REF (LOGIC) signal, from the Frequency Reference Firmware Assembly through A13J6, to a 6.4 kHz reference frequency. The phase lock signal from the 512 to 896 MHz VCO and the 6.4 kHz reference frequency provide the inputs to the phase detector. The phase detector output is integrated to provide the VCO lock frequency voltage. The VCO lock frequency voltage and the sweep ramp signal, if enabled, combine to control the 512 to 896 MHz VCO. The output is split into the phase lock signal, looped back to the phase detector, and the Offset Oscillator output signal. Amplifiers provide gain and isolation. The Sweep Synthesizer Firmware Assembly divides the Offset Oscillator output signal by 256 for the 2.0 to 3.5 MHz frequency and converts the ECL levels to the TTL levels required by the YIG Synthesizer Assembly.

When the $\overline{\text{SWEEP HOLD}}$ line is high, a switch disables the phase detector output signals, allowing the integrator to hold the VCO lock frequency voltage during sweeps.

For Frequency Spans ≤1 MHz (≤100 kHz/Div), the sweep ramp signal is routed to the Offset Oscillator. A sweep scaler allows amplitude selection over four decades (1 dB/10 dB/ 100 dB/1000 dB/Off). The buffered output combines with the VCO lock frequency voltage to control the 512 to 896 MHz VCO.

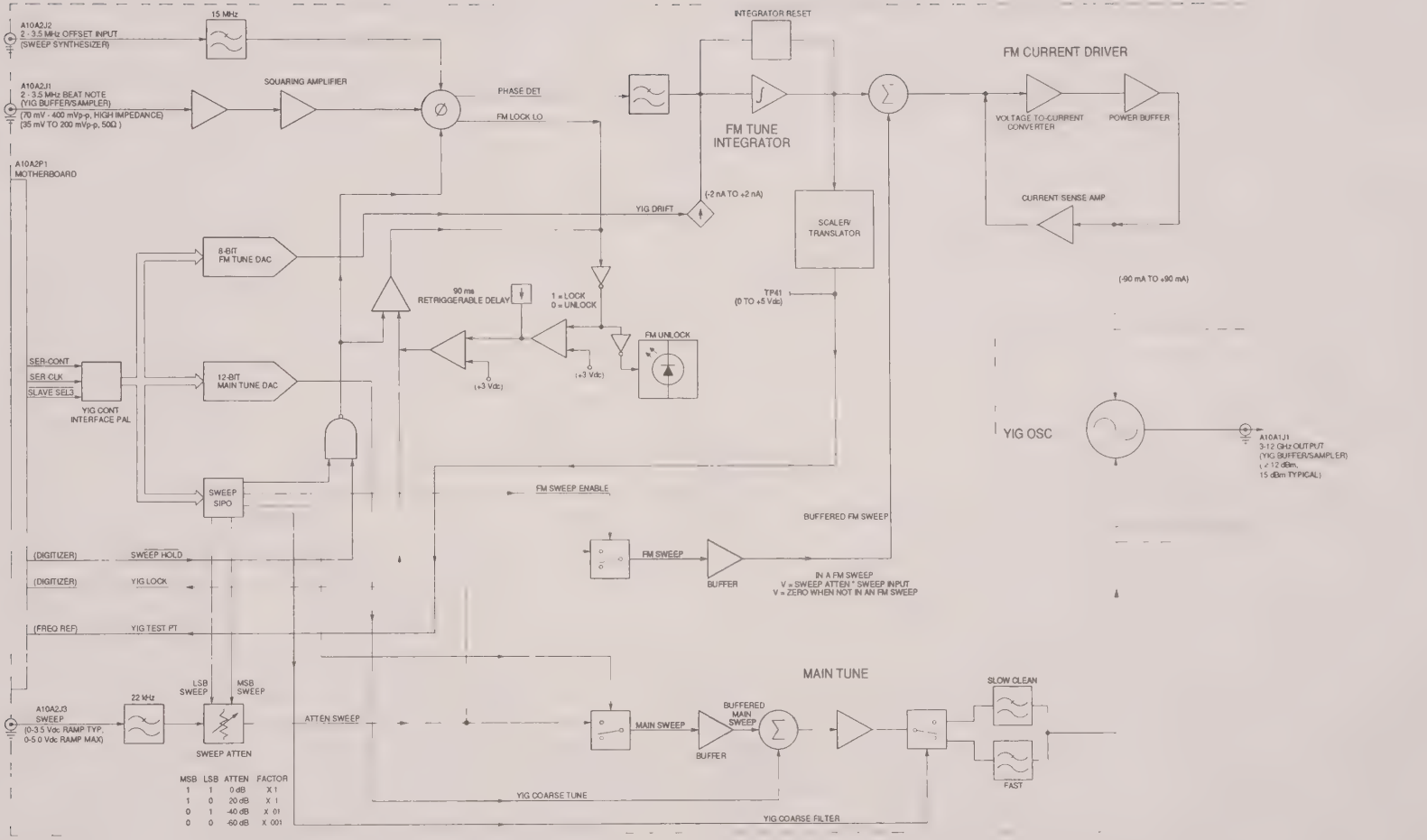

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Figure 2-7 YIG Controller Firmware Assembly Block Diagram

2-4-7 YIG SYNTHESIZER ASSEMBLY

The YIG Synthesizer Assembly contains two major subassemblies, the YIG Controller Firmware Assembly and the Buffer/Sampler Assembly. The YIG Controller Firmware Assembly, with the YIG Oscillator, provides the mixing frequencies used in the frequency conversions. The YIG Buffer/Sampler Assembly sets levels and distributes the YIG Oscillator output. For YIG Frequency calculations, refer to 2-3-2.

A. YIG CONTROLLER FIRMWARE ASSEMBLY

The YIG Controller Firmware Assembly performs the following functions:

- Main Tune

  Main Tune circuits coarsely set the YIG Oscillator and provide wide sweep (>10 MHz Frequency Span) control. Control data to the Main Tune DAC allows the initial coarse setting of the YIG Oscillator. The Main Tune DAC sets the YIG Oscillator to the 100 MHz (±15 MHz) nearest to the frequency required to mix with the set Start Frequency.

  Setting the Frequency Span >1MHz/Div routes the sweep ramp signal, from the Sweep Synthesizer Firmware Assembly through A10A2J3, to the Main Tune line. A Sweep Attenuator scales the sweep ramp signal according to Frequency Span settings with data through the Sweep SIPO (Serial In-Parallel Out).

- FM Tune

  FM Tune circuits make all the fine adjustments to the YIG Oscillator, providing phase lock loop control and narrower sweep widths. The squared Beat Note from the YIG Buffer/Sampler Assembly tunes the YIG Oscillator to within 250 kHz (500 kHz, if YIG Frequency is ≥6602 MHz) of the frequency required to mix with the set Start Frequency and provides the feedback for locking the frequency. The filtered 2 to 3.5 MHz signal, from the Sweep Synthesizer Firmware Assembly through A10A2J2, adjusts the YIG Oscillator to within 25 Hz of the frequency required to mix with the set Start Frequency. When no adjustments are required, the phase detector activates the YIG-LOCK line to the Digitizer Firmware Assembly. The phase detector output through the FM Tune Integrator and summation circuit (adding FM sweep, if selected) goes to the FM Current Driver. The FM Current Driver converts the FM drive signal from a voltage to a driving current, setting the YIG Oscillator for the desired frequency.

  Setting Frequency Spans >1 MHz to 10 MHz (>100 kHz/Div to 1 MHz/Div) routes the sweep ramp signal, from the Sweep Synthesizer Firmware Assembly through A10A2J3, to the FM Tune line. A summation circuit adds the buffered FM sweep to the phase detector output. The FM Current Driver uses the summed signal to adjust the YIG Oscillator.

  Setting Frequency Spans ≤1 MHz (≤100kHz/Div) routes the sweep ramp signal through the Offset Oscillator in the Sweep Synthesizer Firmware Assembly. The resulting swept signal, part of the 2 to 3.5 MHz signal through A10A2J3, adjusts the YIG Oscillator through the phase detector, FM Tune Integrator and FM Current Driver.

- YIG Oscillator

  The YIG Oscillator output has different usable frequency ranges according to the Spectrum Analyzer model: (3.6 to 6.5 GHz for the AN920), (3 to 12.5 GHz for the AN930 or AN930A) and (3 to 13.04465 GHz for the AN940). For the External Mixer function, the YIG Oscillator usable output ranges from 3 to 13 GHz for the AN920, AN930 and AN930A or 3 to 13.04465 GHz for the AN940. The YIG Oscillator output goes to the YIG Buffer/Sampler Assembly for level adjustments and distribution.

B. YIG BUFFER/SAMPLER ASSEMBLY

The YIG Buffer/Sampler Assembly interfaces with the YIG Controller Firmware Assembly and distributes the YIG Oscillator output signal at compatible levels. The YIG Buffer/Sampler Assembly distributes four isolated outputs as follows:

- Beat Note to YIG Controller Firmware Assembly

  The Beat Note circuit helps lock the YIG Oscillator to the correct frequency required to mix with the set Start Frequency. The Sampler phase detector receives the amplified and filtered 101 to 107 MHz signal, from the Sampler Synthesizer Firmware Assembly through A10A1J3, and the twice split YIG Oscillator signal with an adjusted level. The buffered IF Beat Note output goes through an 18 MHz Low-Pass Filter to keep out the YIG Oscillator signal. When locked for the Start Frequency, the 30 to 300 mV_{P-P} Beat Note oscillates at a 2 to 3.5 MHz frequency, in phase with the 2 to 3.5 MHz signal from the Offset Oscillator in the Sweep Synthesizer Firmware Assembly. Before locking and during sweeps the Beat Note frequency ranges ±15 MHz. The YIG Buffer/Sampler Assembly sends the Beat Note to the YIG Controller Firmware Assembly.

- RF LO to RF Receiver Assembly

  The RF LO, through A10A1J4, provides a 3.6 to 6.5 GHz signal at >+6 dBm to the RF Receiver Assembly, when operating in Band 0. The YIG Buffer/Sampler Assembly also provides the automatic level control of the initial YIG Oscillator output through the RF LO circuit. The YIG Oscillator output, after level adjustments, splits into two primary paths. One path, after more level adjustments, splits into two secondary paths. One path is buffered and split into the RF LO output and the automatic level control line. The Leveling Detector feeds the Automatic Level Control (ALC) Amplifier, providing the bias voltage for the initial amplifier.

- µWAVE LO to Microwave Receiver Assembly (N/A for AN920)

  The µWAVE LO, through A10A1J5, provides a 3 to 12.5 GHz signal (AN930 or AN930A) or 3 to 13.04465 GHz (AN940) at >+9 dBm to the Microwave Receiver Assembly, when operating in Bands 1 or 2. The buffered µWAVE LO splits off of the same primary path as the RF LO.

- AUX LO to EXTERNAL MIXER LO Connector or Tracking Generator (Option 02)

  The AUX LO, through A10A1J2, provides a 3 to 13 GHz signal (AN920, AN930 or AN930A) or 3 to 13.04465 GHz (AN940) at >+10 dBm to the EXTERNAL MIXER LO Connector (W9/W10J1). If the Tracking Generator Option 02 is installed, the YIG Buffer/Sampler Assembly sends the AUX LO through the Tracking Generator Assembly. The buffered AUX LO splits off of the same primary path as the Beat Note.

2-4-8 MICROWAVE RECEIVER OR ATTENUATOR ASSEMBLY

NOTE: The Attenuator Assembly replaces the Microwave Receiver Assembly in the AN920.

Refer to System Block Diagram, Figure 2-2.

The Microwave Receiver Assembly performs the following functions:

- Signal Attenuation

  The Microwave Receiver Assembly (AN930, AN930A and AN940) or Attenuator Assembly (AN920) receives the incoming signal through the ANALYZER INPUT Connector (A9J1). Attenuation control, from the Sweep Synthesizer Firmware Assembly (A9AT1W1), activates the Step Attenuator according to internal attenuation settings, from 0 to 60 dB in 10 dB steps. For the AN920, the Attenuator Assembly sends the attenuated input signal to the RF Receiver Assembly, through A9AT1J2.

- Signal Routing (N/A for AN920)

  The Microwave Receiver Assembly routes the signal according to operating band. If in Band 0, the Microwave Receiver Assembly sends the attenuated input signal to the RF Receiver Assembly, through A9AT1J2. If in Band 1, the Microwave Receiver Assembly routes the signal through the YIG Filter to the Fundamental Microwave Mixer. If in Band 2, the Microwave Receiver Assembly routes the signal through the YIG Filter to the Harmonic Microwave Mixer.

- Microwave Preselector (YIG Filter) (N/A for AN920)

  The Microwave Preselector (YIG Filter), when activated, allows only a narrow band of frequencies to enter the microwave mixers. The YIG Filter eliminates many spurious responses and prevents unwanted mixing products from appearing on the CRT. Preselector control, from the Sweep Synthesizer Firmware Assembly (A9W1), sets the bandwidth.

- Microwave Converter (N/A for AN920)

  The Microwave Receiver Assembly performs the first conversion of signals in Band 1 or 2. The µWAVE LO, 3 to 12.5 MHz (AN930 or AN930A) or 3 to 13.04465 (AN940), from the YIG Synthesizer Assembly enters the Microwave Receiver Assembly through A9A1J3 at a nominal +13 dBm. For Band 1, the Fundamental Microwave Mixer mixes the fundamental µWAVE LO with the input signal. For Band 2, the balanced Harmonic Microwave Mixer, subharmonically pumped, mixes the second harmonic of the µWAVE LO with the input signal. Either mixer provides the required 410.7 MHz signal, driven to the 410 MHz IF Assembly through A9A1J2.

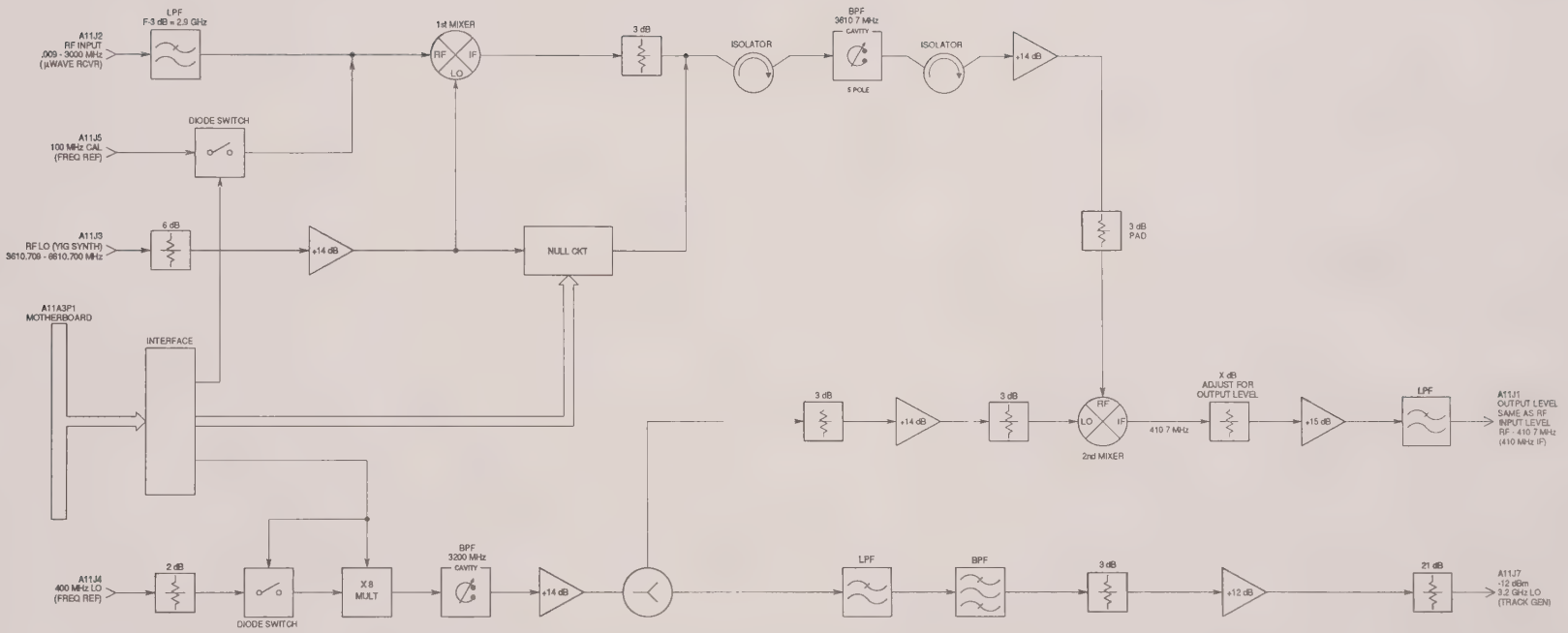

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Figure 2-8 RF Receiver Assembly Block Diagram

2-4-9 RF RECEIVER ASSEMBLY

The RF Receiver Assembly, as the main task, converts signals in Band 0 (9 kHz to 2.9 GHz) to the required frequency. The RF Receiver Assembly performs functions as follows:

- 1st Mixer

  The 9 kHz to 2.9 GHz RF Input signal, from the Microwave Receiver Assembly (Attenuator Assembly for AN920) through A11J2, goes through a Low-Pass Filter to keep the 1st LO from going back through A11J2. After some impedance matching, the input signal becomes the RF input to the 1st Mixer. The 3.6 to 6.5 GHz (3610.709 to 6610.700 MHz) RF LO, from the YIG Synthesizer Assembly, enters the RF Receiver Assembly through A11J3 at +10 dBm. The impedance matched and filtered RF LO becomes the LO input to the 1st Mixer (1st LO). A Null Circuit reduces the 1st LO level on the mixer output. The 3610.7 MHz output signal passes through a ≈35 MHz (±15%) wide Bandpass Filter (at 3 dB). The Bandpass Filter sets the broadband noise floor. An amplifier increases the signal level to counteract losses in the filtering and mixing processes and sends the signal to the 2nd Mixer.

- 2nd LO

  The 2nd LO uses the 400 MHz LO signal at +5 dBm, from the Frequency Reference Assembly through A11J4. A multiplier circuit (X8), using a step recovery diode, converts the 400 MHz to 3200 MHz. The signal passes through a 3.2 GHz Bandpass Filter to an amplifier circuit providing 13 to 14 dB gain. One signal provides the 3.2 GHz output. The other signal drives the LO input to the 2nd Mixer. Filters provide reverse isolation from signals external to the RF Receiver Assembly.

- 2nd Mixer

  The 3610.7 MHz signal, the IF output from the 1st Mixer, goes through a bandpass filter and impedance matching circuit to become the RF input to the 2nd Mixer. The 2nd Mixer receives the 3200 MHz 2nd LO at -10 dBm. The 2nd Mixer mixes the 3610.7 MHz RF and 3200 MHz LO signals for a 410.7 MHz IF output. The RF Receiver Assembly filters and adjusts the level of the 410.7 MHz signal to equal the level of the RF Input signal.

- Signal Distribution

  The RF Receiver Assembly provides two output signals:

  - 410.7 MHz (A11J1) input signal to the 410 MHz IF Firmware Assembly, at the same level as the RF Input signal (A11J2).

  - 3.2 GHz (A11J7) LO signal to the Tracking Generator Assembly (Option 02), if installed, at -3 dBm (±2 dB).

The 100 MHz CAL signal at -10 dBm, from the Frequency Reference Firmware Assembly through A11J5, allows calibration of the RF Receiver Assembly.

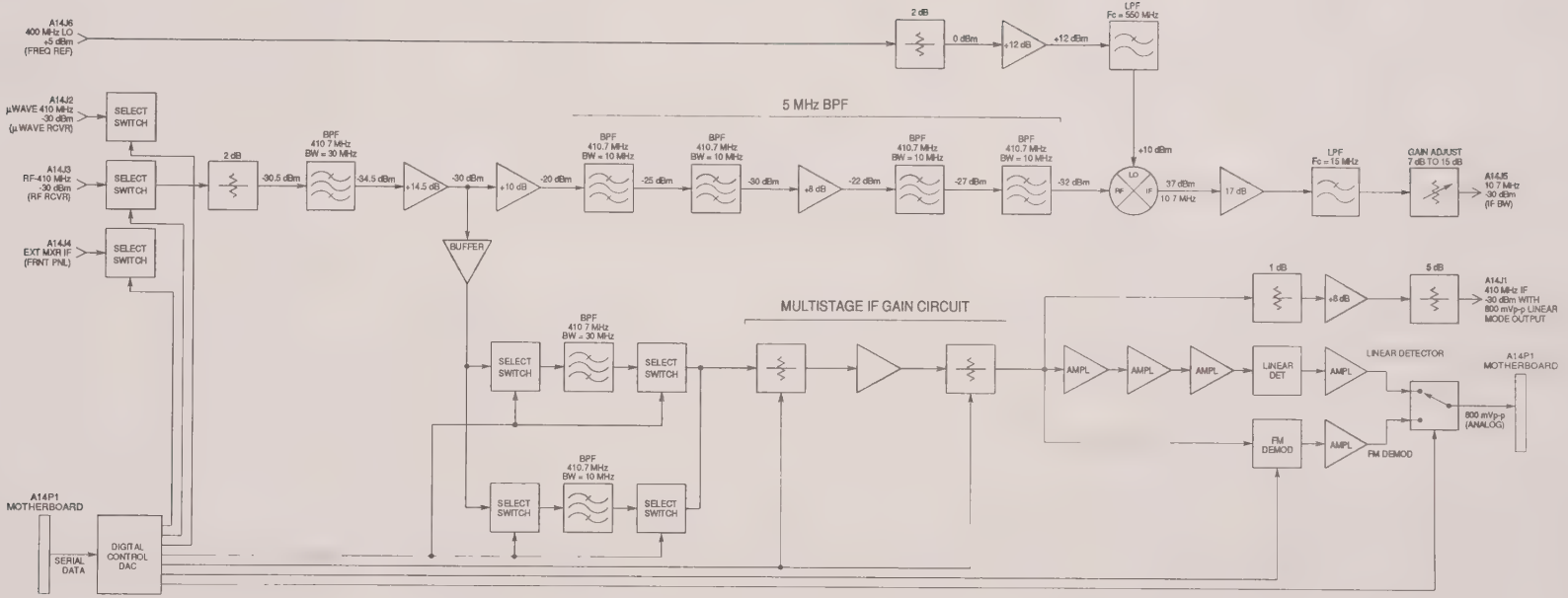

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Figure 2-9 410 MHz IF Firmware Assembly Block Diagram

2-4-10 410 MHz IF FIRMWARE ASSEMBLY

The 410 MHz Firmware Assembly performs the following functions:

- Input Signal Selection

  The 410 MHz IF Firmware Assembly receives one of three 410.7 MHz signal inputs, according to function and operating band:

  - RF-410 MHz signal from the RF Receiver Assembly, through A14J3, for normal operation in Band 0.
  - µWAVE 410 MHz from the Microwave Receiver Assembly, through A14J2, for normal operation in Bands 1 and/or 2 (N/A for AN920).
  - EXTERNAL MIXER IF signal from the EXTERNAL MIXER IF Connector (W6J1), through A14J4, when operating the External Mixer function.

  The 410 MHz IF Firmware Assembly attenuates, filters and amplifies the 410.7 MHz signal. The signal splits into two paths (wideband and narrow band), each with a buffer amplifier.

- Frequency Conversion (Narrow Band)

  The buffered 410.7 MHz signal passes through a 5 MHz (±0.5 MHz) wide Bandpass Filter, consisting of four offset 10 MHz wide Bandpass Filters and an amplifier to provide the right RF input level to the mixer. After some level adjustments and filtering, the 400 MHz LO from the Frequency Reference Firmware Assembly through A14J6, enters the mixer as the LO input. The mixer converts the 410.7 MHz RF input to a 10.7 MHz IF output. The 410 MHz IF Firmware Assembly amplifies the signal above the initial input level. A 15 MHz Low-Pass Filter prevents passage of unwanted harmonics. An attenuator adjusts the output level to match the initial input level. The 410.7 MHz IF Firmware Assembly sends the 10.7 MHz output to the one of the IF Bandwidth PC Board Assemblies through A14J5.

- Wideband Operation

  The wideband signal passes through one of two wideband filters (10 or 30 MHz), according to RBW selection. The Multistage IF Gain Circuit sets the level according to internal IF Gain settings from 0.0 to 20.0 dB. The adjusted wideband signal feeds three circuits: 410.7 MHz IF OUT Connector, Linear Detector and FM Demodulator.

  The 410 MHz IF Firmware Assembly adjusts the level for a unity gain module output, through A14J1, to the 410.7 MHz IF OUT Connector (J3B/J3A).

  The signal requires amplification to drive the low impedance Linear Detector. The low impedance Linear Detector allows high speed pulse demodulation (for pulses ≥100 ns wide). A wideband (≈12 MHz) operational amplifier drives the 410 DEMOD (Wideband Video) signal to the Analog Firmware Assembly, if selected by the control switch. During normal operation, setting the RBW ≥10 MHz selects the wideband Linear Detector.

  The FM Demodulator has a baseband output of 800 mV_{P-P} at 8 MHz_{P-P} deviation. The baseband video output bandwidth is ≥12 MHz at the 3 dB point. A wideband operational amplifier drives the 410 DEMOD (Wideband Video) signal to the Analog Firmware Assembly, if selected by the control switch. When operating in the AM/FM Receiver User-Defined demodulation mode, setting the RBW ≥10 MHz and Demodulation Scale ≥200 kHz/Div selects the wideband FM Demodulator.

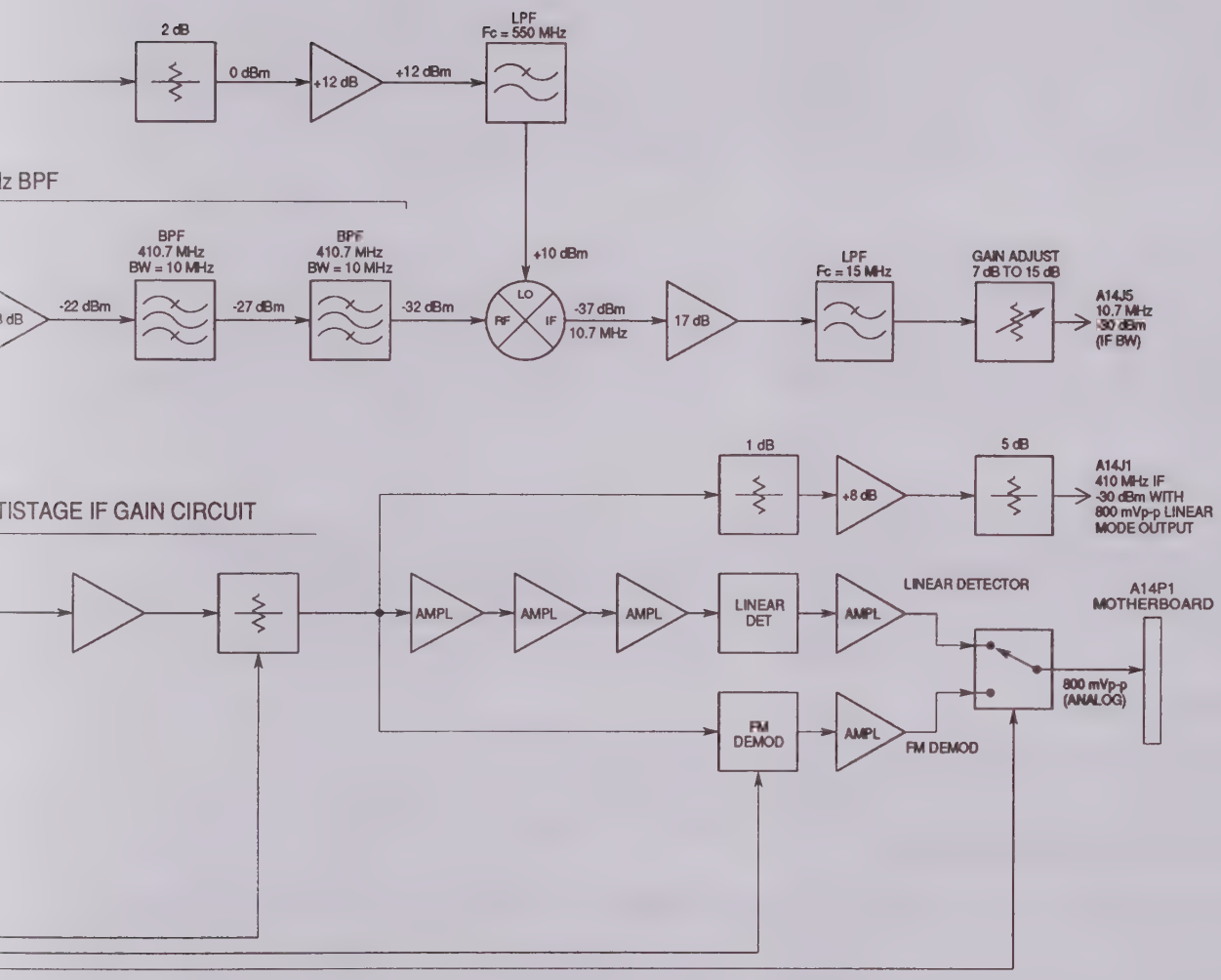

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Figure 2-9 410 MHz IF Firmware Assembly Block Diagram

2-4-10 410 MHz IF FIRMWARE ASSEMBLY

The 410 MHz Firmware Assembly performs the following functions:

- Input Signal Selection

  The 410 MHz IF Firmware Assembly receives one of three 410.7 MHz signal inputs, according to function and operating band:

  - RF-410 MHz signal from the RF Receiver Assembly, through A14J3, for normal operation in Band 0.
  - µWAVE 410 MHz from the Microwave Receiver Assembly, through A14J2, for normal operation in Bands 1 and/or 2 (N/A for AN920).
  - EXTERNAL MIXER IF signal from the EXTERNAL MIXER IF Connector (W6J1), through A14J4, when operating the External Mixer function.

  The 410 MHz IF Firmware Assembly attenuates, filters and amplifies the 410.7 MHz signal. The signal splits into two paths (wideband and narrow band), each with a buffer amplifier.

- Frequency Conversion (Narrow Band)

  The buffered 410.7 MHz signal passes through a 5 MHz (±0.5 MHz) wide Bandpass Filter, consisting of four offset 10 MHz wide Bandpass Filters and an amplifier to provide the right RF input level to the mixer. After some level adjustments and filtering, the 400 MHz LO from the Frequency Reference Firmware Assembly through A14J6, enters the mixer as the LO input. The mixer converts the 410.7 MHz RF input to a 10.7 MHz IF output. The 410 MHz IF Firmware Assembly amplifies the signal above the initial input level. A 15 MHz Low-Pass Filter prevents passage of unwanted harmonics. An attenuator adjusts the output level to match the initial input level. The 410.7 MHz IF Firmware Assembly sends the 10.7 MHz output to the one of the IF Bandwidth PC Board Assemblies through A14J5.

- Wideband Operation

  The wideband signal passes through one of two wideband filters (10 or 30 MHz), according to RBW selection. The Multistage IF Gain Circuit sets the level according to internal IF Gain settings from 0.0 to 20.0 dB. The adjusted wideband signal feeds three circuits: 410.7 MHz IF OUT Connector, Linear Detector and FM Demodulator.

  The 410 MHz IF Firmware Assembly adjusts the level for a unity gain module output, through A14J1, to the 410.7 MHz IF OUT Connector (J3B/J3A).

  The signal requires amplification to drive the low impedance Linear Detector. The low impedance Linear Detector allows high speed pulse demodulation (for pulses ≥100 ns wide). A wideband (≈12 MHz) operational amplifier drives the 410 DEMOD (Wideband Video) signal to the Analog Firmware Assembly, if selected by the control switch. During normal operation, setting the RBW ≥10 MHz selects the wideband Linear Detector.

  The FM Demodulator has a baseband output of 800 mV_{P-P} at 8 MHz_{P-P} deviation. The baseband video output bandwidth is ≥12 MHz at the 3 dB point. A wideband operational amplifier drives the 410 DEMOD (Wideband Video) signal to the Analog Firmware Assembly, if selected by the control switch. When operating in the AM/FM Receiver User-Defined demodulation mode, setting the RBW ≥10 MHz and Demodulation Scale ≥200 kHz/Div selects the wideband FM Demodulator.

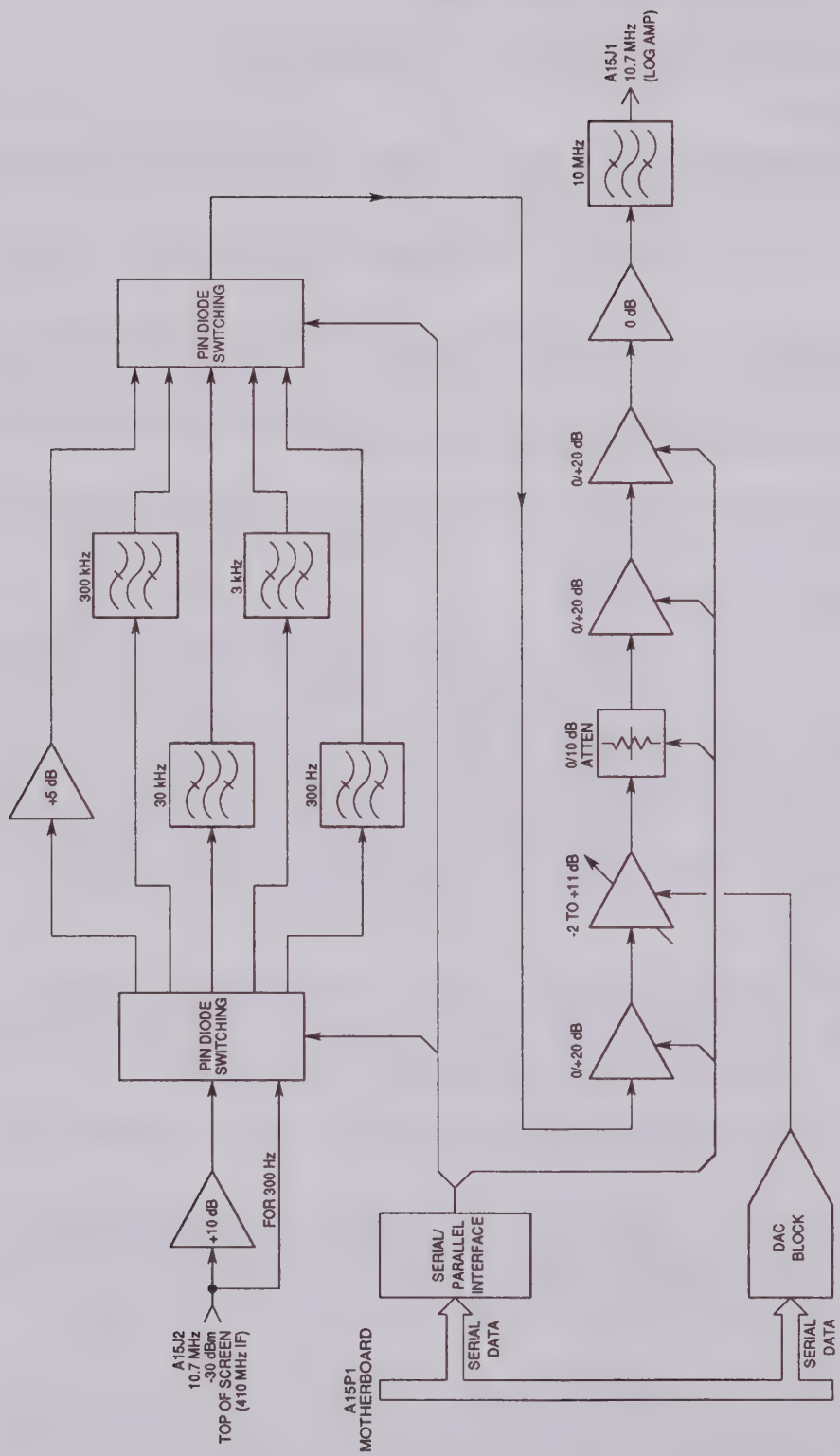

Figure 2-10 IF BW Standard PC Board Assembly Block Diagram

2-4-11 IF BANDWIDTH STANDARD PC BOARD ASSEMBLY

The IF Bandwidth Standard PC Board Assembly sets part of the internal IF Gain (and compensation gain) and standard RBW for narrow band signals (≤5 MHz RBW). The IF Bandwidth Standard PC Board Assembly receives the 10.7 MHz IF signal from the 410 MHz IF Firmware Assembly or IF Bandwidth Option PC Board Assembly (if installed), through A15J2.

The RBW setting determines the filter path through Pin Diode Switching. All the bandpass filters center around 10.7 MHz. The IF Bandwidth Standard PC Board Assembly provides the following selectable RBW Filters:

- None (5 MHz)

  Setting the RBW to 5 MHz, selects the 5 MHz Filter in the 410 MHz IF Firmware Assembly. The IF Bandwidth Standard PC Board Assembly amplifies the signal +10 dB prior to switching. After switching, another amplifier provides +5 dB of gain with no filtering.

- 300 kHz

  Setting the RBW to 300 kHz, selects the 300 kHz Filter line. The IF Bandwidth Standard PC Board Assembly amplifies the signal +10 dB before switching. The amplifier in the circuit provides +17 dB of gain (+12 dB compensates for filter insertion loss).

- 30 kHz

  Setting the RBW to 30 kHz, selects the 30 kHz Filter line. The IF Bandwidth Standard PC Board Assembly amplifies the signal +10 dB before switching. The amplifier in the circuit provides +6.75 dB gain (+1.75 dB compensates for filter insertion loss).

- 3 kHz

  Setting the RBW to 3 kHz, selects the 3 kHz Filter line. The IF Bandwidth Standard PC Board Assembly amplifies the signal +10 dB before switching. The amplifier in the circuit provides +9.5 dB gain (+4.5 dB compensates for filter insertion loss).

- 300 Hz

  Setting the RBW to 300 Hz, selects the 300 Hz Filter line. The IF Bandwidth Standard PC Board Assembly does not amplify the 300 Hz Filter line before switching, to improve drive level versus insertion loss linearity. The amplifier in the circuit provides +28 dB gain (+12 dB compensates for filter insertion loss).

The Filter section output, 15 dB above the initial input level, enters the six stage IF Gain section. The IF Gain section provides compensation gain (for calibration, filter insertion loss drift, band switching, etc.) and the -10.0 to +45.0 dB range of internal gain. The IF Gain section consists of a 0 or +20 dB gain stage, a -2 to +11 variable gain stage, a 0 or 10 dB attenuator, two more 0 or +20 dB gain stages and an output filter buffer/gain stage. Control data through the Serial/Parallel Interface controls the 0 or +20 dB gain stages and the 0 or 10 dB attenuator. A DAC Block sets the variable gain stage to provide 0.1 dB increments. A High-Pass/Low-Pass Filter reduces noise power density and has a 3 dB bandwidth of 10 MHz. The IF Bandwidth Standard PC Board Assembly drives the 10.7 MHz signal, at ≈27 dB above the initial input level (+ any internal IF gain), to the Log Amp Firmware Assembly, through A15J1.

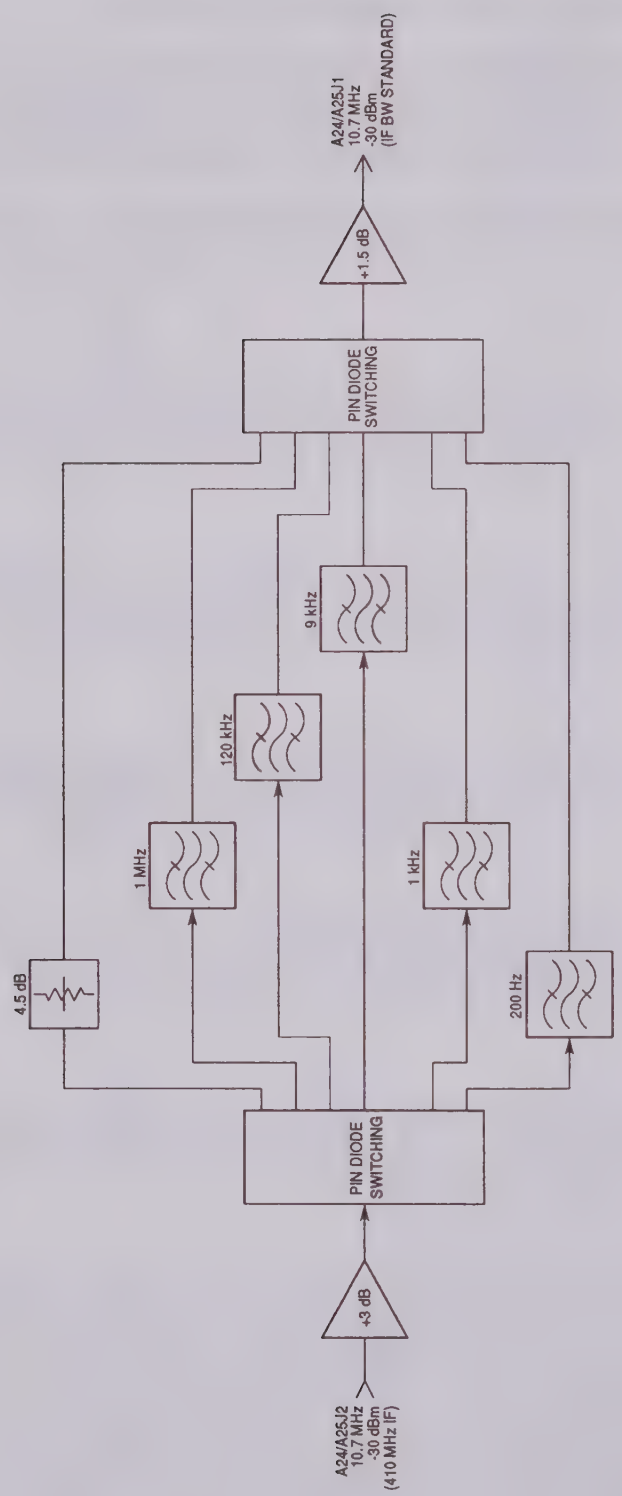

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Figure 2-11 IF BW Option PC Board Assembly Block Diagram

2-4-12 IF BANDWIDTH OPTION PC BOARD ASSEMBLY

The unit contains an IF Bandwidth Option PC Board Assembly when the Quasi-Peak (Option 08) or Supplemental RBW Filters (Option 07 for AN930) is installed.

The IF Bandwidth Option PC Board Assembly receives the 10.7 MHz IF signal from the 410 MHz IF Firmware Assembly, through A25J2 or A24J2 (AN930 with Option 07). An amplifier increases signal level by 3 dB.

The RBW setting determines the filter path through Pin Diode Switching. All the bandpass filters center around 10.7 MHz. Each filter line amplifies the signal to compensate for filter insertion loss - 4.5 dB (already compensated for with the input and output amplifiers). The IF Bandwidth Option PC Board Assembly has a bypass line and adds five extra selectable RBW filters:

- None (Bypass Line)

  Setting the RBW to 5 MHz, 300 kHz, 30 kHz, 3 kHz or 300 Hz; selects the 5 MHz Filter in the 410 MHz IF Firmware Assembly or a filter on the IF Bandwidth Standard PC Board Assembly. The IF Bandwidth Option PC Board Assembly attenuates the signal -4.5 dB to counteract the amplification for an equal input/output level.

- 1 MHz

  Setting the RBW to 1 MHz, selects the 1 MHz Filter line.

- 120 kHz

  Setting the RBW to 120 kHz, selects the 120 kHz Filter line. Quasi-Peak operation allows selection of the 120 kHz Filter.

- 9 kHz

  Setting the RBW to 9 kHz, selects the 9 kHz Filter line. Quasi-Peak operation allows selection of the 9 kHz Filter.

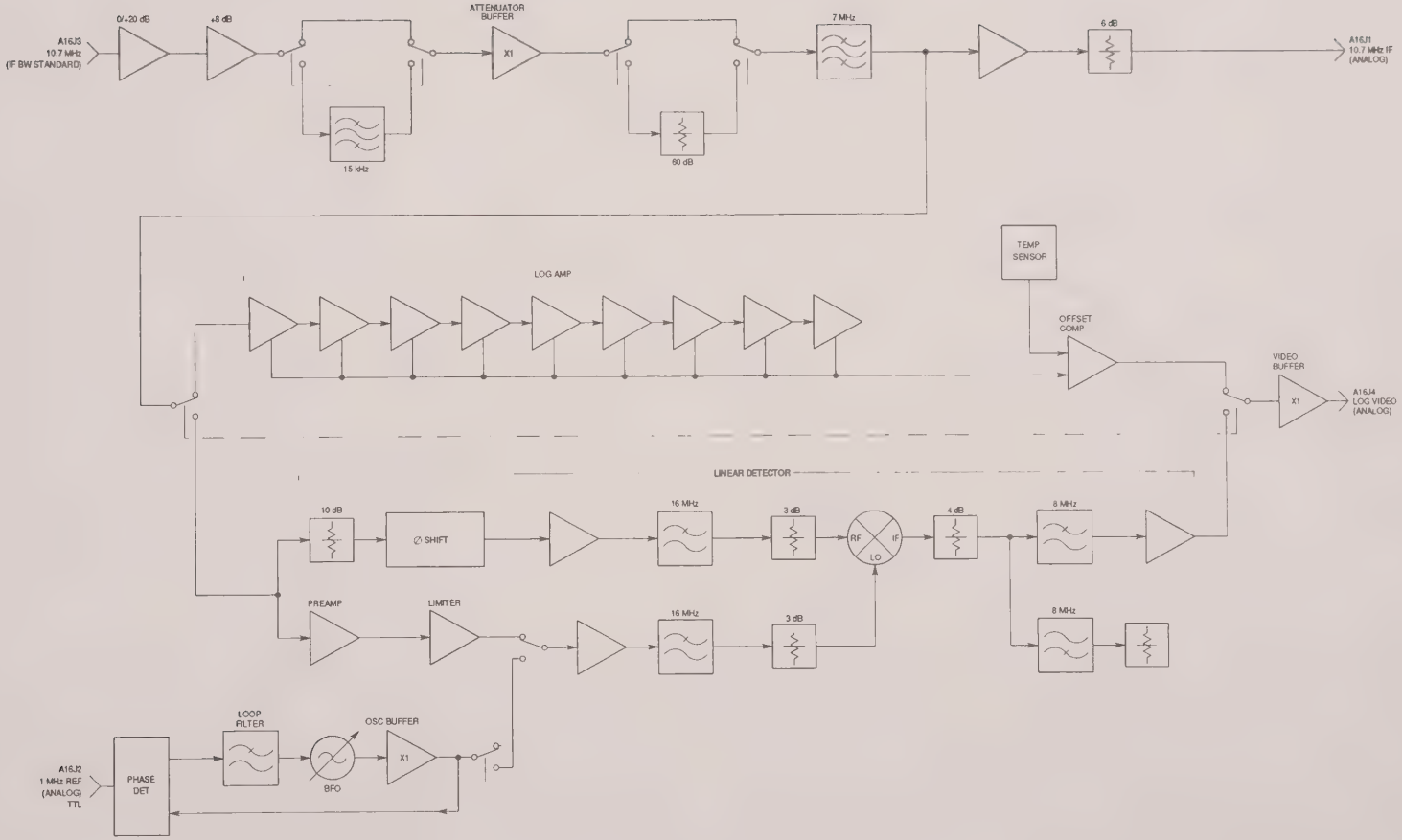
- 1 kHz

  Setting the RBW to 1 kHz, selects the 1 kHz Filter line.

- 200 Hz

  Setting the RBW to 200 Hz, selects the 200 Hz Filter line. Quasi-Peak operation allows selection of the 200 Hz Filter.

An amplifier increases the signal level by 1.5 dB to set the output level the same as the input level. The IF Bandwidth Option PC Board Assembly sends the 10.7 MHz IF output to the IF Bandwidth Standard PC Board Assembly, through A25J1 or A24J1 (AN930 with Option 07).



7201007

Figure 2-12 Log Amp Firmware Assembly Block Diagram

2-4-13 LOG AMP FIRMWARE ASSEMBLY

The Log Amp Firmware Assembly receives the filtered 10.7 MHz signal from the IF Bandwidth Standard PC Board Assembly, through A16J3. The Log Amp Firmware Assembly converts the incoming signal to the analog voltages required by the Analog Firmware Assembly. The amplifier and detector circuits provide the signal for Logarithmic display modes, Linear display modes and FFT operation.

The Log Amp Firmware Assembly performs the following functions:

- Last Stage of Internal IF Gain

  A 0 or 20 dB amplifier circuit provides the last stage of selected internal IF Gain (+45.0 to +65.0 dB). Because the Log Amp Firmware Assembly circuits operate at a wider band than the incoming filtered signal, a filter is required to limit the noise bandwidth. For RBW settings ≤9 kHz, the signal passes through the switchable 15 kHz Crystal Filter. All signals pass through the 7 MHz Bandpass Filter following the switchable 60 dB Attenuator. The Attenuator Buffer provides the proper load to the 15 kHz Crystal Filter and low impedance drive to the 60 dB Attenuator. The switchable 60 dB Attenuator is used when calibrating the Log Amp Firmware Assembly video gain. The signal bypasses the 60 dB Attenuator during normal operation. After the 7 MHz Bandpass Filter, the signal splits. One path provides a high impedance buffer and attenuator for the 10.7 MHz signal, A16J1, to the Analog Firmware Assembly AM/FM circuits and the 10.7 MHz IF OUT Connector (J4B/J4A) on the rear panel. The output level remains approximately the same as the initial input level. The other path goes to Logarithmic Amplifier, Linear Detector or FFT Detector.

- Logarithmic Amplifier

  The signal goes through the Logarithmic Amplifier IC when operating in Logarithmic display modes. The amplifier following the Logarithmic Amplifier provides slope (gain) and offset adjustment, and also sums in temperature correction. The video signal passes through a high isolation FET switch to the Video Buffer. The unity gain Video Buffer reduces ringing and sends the logarithmic video signal (-400 to +400 mV), through A16J4, to the Analog Firmware Assembly.

- Linear Detector

The signal goes through the Linear Detector circuit when operating in the Linear display mode. For normal linear detection the path splits to provide the RF and LO inputs to a double-balanced mixer. The LO path has a Preamplifier and a high gain Limiter to provide a constant LO drive for inputs ≈55 dB below full-scale. After the FFT mode switch and LO driver, the LO signal passes through a 16 MHz Low-Pass Filter to reduce harmonics, mostly generated by the limiting action of the carrier recovery Limiter amplifier. A 3 dB Attenuator improves the match at the LO input for predictable filter response. The RF input signal goes through a balun splitter for greater isolation and a Phase Shift circuit. The Phase Shift circuit creates the 180° phase shift from the LO input signal, so the recovered signal can be scaled from the negative cosine of the phase difference. A buffer increases RF-LO isolation. The 16 MHz Low-Pass Filter and 3 dB Attenuator maintain the circuit balance with the LO path. The 8 MHz Low-Pass/High-Pass Diplexer reduces mixer intermodulation products and improves linearity of the mixer IF output to the video amplifier. The Low-Pass Filter passes the video and the High-Pass Filter terminates the sum products without reflection. The video amplifier output signal passes through a high isolation FET switch to the Video Buffer. The unity gain Video Buffer reduces ringing and sends the linear video signal (-400 to +400 mV), through A16J4, to the Analog Firmware Assembly.

- FFT Detector (Frequency Span ≤200 Hz/Div)

The signal goes through the Linear Detector circuit when operating in the FFT mode. Only the LO source for the mixer changes between the normal Linear display mode and the FFT mode. Using the 1 MHz REF TTL signal, from the Analog Firmware Assembly through A16J2, a programmable BFO synthesizer provides an LO in 800 or 1000 Hz steps (±50 kHz) around 10.7 MHz. A passive lead-lag Loop Filter controls the BFO. The Oscillator Buffer provides the PLL sample to the Phase Detector and the LO input to the mixer. The FFT LO source signal passes through the FFT mode switch, 16 MHz Low-Pass Filter and 3 dB Attenuator. The 8 MHz Low-Pass/High-Pass Diplexer reduces mixer intermodulation products and improves linearity of the mixer IF output to the video amplifier. The video amplifier output signal passes through the high isolation FET switch to the Video Buffer. The unity gain Video Buffer reduces ringing and sends the FFT video signal (-400 to +400 mV), through A16J4, to the Analog Firmware Assembly. The FFT circuit, using the BFO, effectively simulates the narrower RBW filters. Refer to 2-3-3B1 for related information.

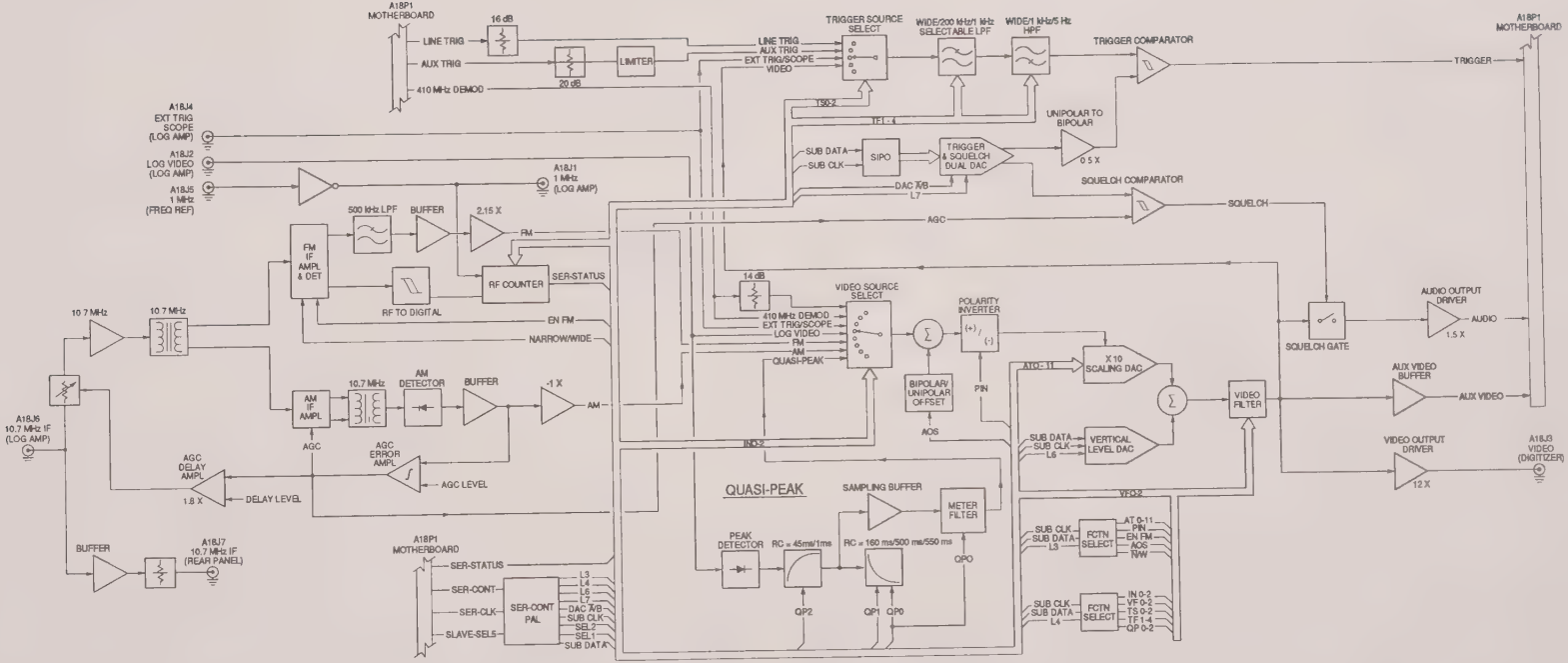


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Figure 2-13 Analog Firmware Assembly (AN930) Block Diagram

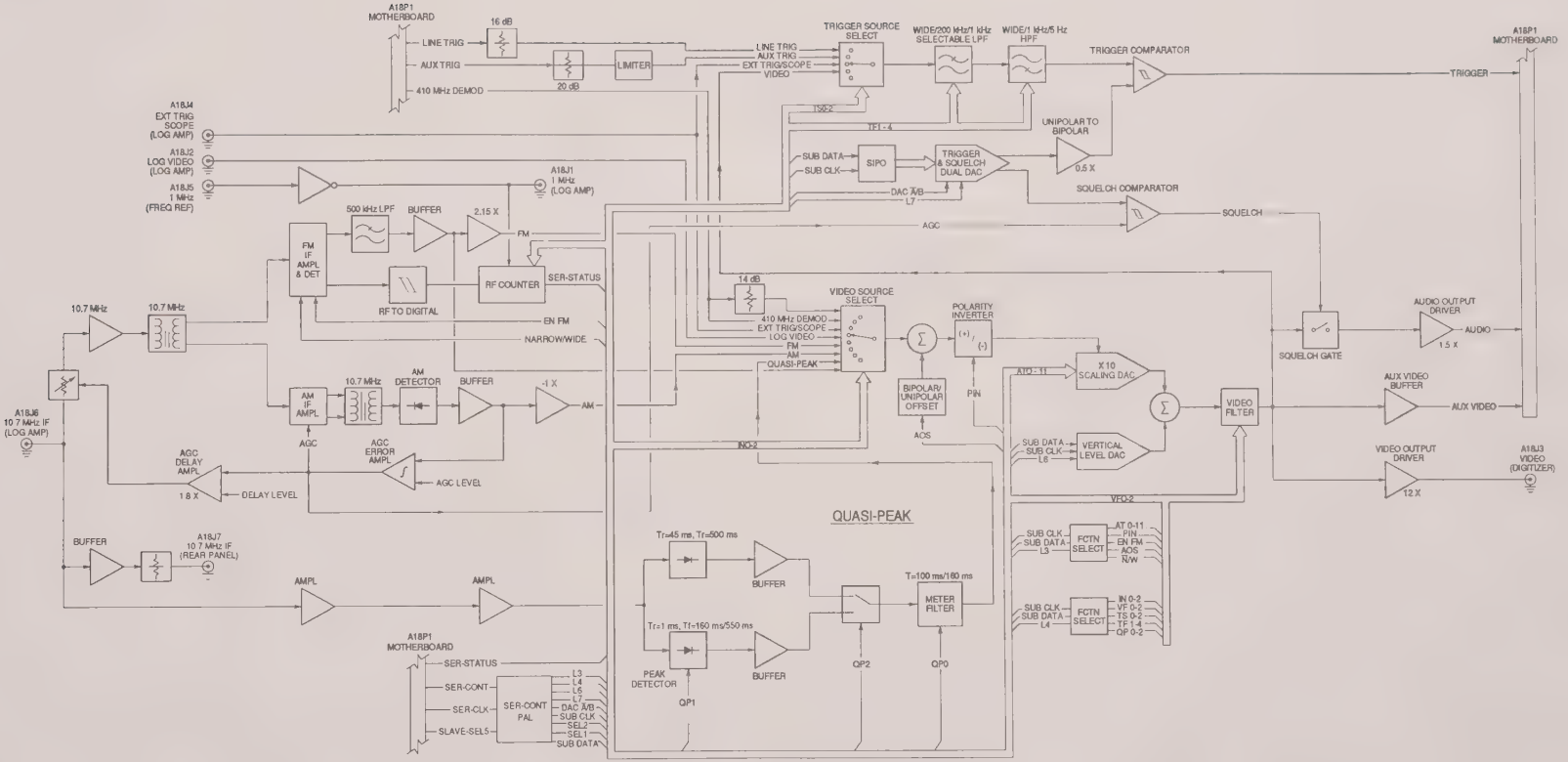

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Figure 2-14 Analog Firmware Assembly (AN920, AN930A, AN940) Block Diagram

2-4-14 ANALOG FIRMWARE ASSEMBLY

The Analog Firmware Assembly performs the following functions:

- Video Source Selection

  The Video Source Select connects one of seven available video inputs to the active circuit:

  - Wideband FM (Frequency Deviation set ≥1 MHz/Div and RBW set ≥10 MHz), from the 410 MHz IF Firmware Assembly on the 410 MHz DEMOD line (through a ÷5 Attenuator).
  - Wideband Video (RBW set ≥10 MHz), from the 410 MHz IF Firmware Assembly on the 410 MHz DEMOD line.
  - Digital Oscilloscope or low frequency (≤24 kHz) FFT signals through the EXTERNAL INPUT Connector (A12J2), the Front Panel Assembly and A18J4 (EXT TRIG/SCOPE).
  - Logarithmic, Linear or normal operation FFT signals from the Log Amp Firmware Assembly through A18J2 (LOG VIDEO).
  - Normal band FM signal from the FM Detector circuit in the Analog Firmware Assembly.
  - Normal band AM signal from the AM Detector circuit in the Analog Firmware Assembly.
  - Quasi-Peak signal from the Quasi-Peak circuit in the Analog Firmware Assembly.

  An Amplitude Scaling DAC compensates for an expansion gain amplifier. A 12-bit Vertical Level DAC provides the Amplitude Scale Offset (controlled by the V POS [Vertical Position] field setting when the Digital Oscilloscope function is active) to the expansion gain amplifier. The Video Bandwidth field setting (10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz or None) controls the Video Filter. The output video feeds the following circuits:

  - The Video Output Driver provides normal full scale video at 4.5 V_{P-P} (0.5625 V/Div) (into a 680 Ω, 50 pF load), through A18J3 to the Digitizer Firmware Assembly.
  - The Auxiliary Video Buffer sends the video signal (AUX VIDEO) at 0.1 V/Div (±5%) (into a 1 MΩ load) to the FUNCTION Connector (W40J1, pin 7).
  - When the AM/FM Receiver is activated, the audio circuit, containing filtering and squelch control, drives the signal (AUDIO or RCVR-AUDIO), to the Front Panel Assembly at 1 V_{P-P} (±10%) for a full display. The AM/FM Receiver within the Analog Firmware Assembly, along with the SQUELCH Control input from the Front Panel Assembly through the System Controller Firmware Assembly, control the Squelch Gate.
  - The Trigger Source Select uses the video signal as one of the trigger sources.

- Trigger Source Selection

  The Trigger Source Select connects one of four trigger sources to the sweep trigger line (TRIGGER or DIG TRIGGER) to the Digitizer Firmware Assembly (output level specified within ±3%):

  - Line Trigger (±2.7 V) from the ac line (only if connected) through the Power Supply Assembly
  - Auxiliary Trigger (±4 V) from an external source connected to pin 8 on the FUNCTION Connector on the rear panel
  - External Trigger (±0.4 V) through the EXTERNAL INPUT Connector (A12J2), the Front Panel Assembly and A18J4 (EXT TRIG/SCOPE)
  - Internal video (32 counts/Div over eight divisions) from the Video Filter output within the Analog Firmware Assembly

  The Analog Firmware Assembly filters and compares the trigger signal level with a voltage reference set by the Trigger & Squelch Dual DAC.

- Frequency Counter

  The Frequency Counter counts the 10.7 MHz IF signal from the Log Amp Firmware Assembly through A18J6 and the FM Detector. The Analog Firmware Assembly converts the 10.7 MHz IF into a TTL level signal for the internal RF Counter. The 1 MHz (LOGIC or REF), through A18J5, from the Frequency Reference Firmware Assembly provides the reference signal used by the RF Counter. The RF Counter produces a maximum resolution of 1 Hz by dividing the 1 MHz reference by as much as six decades. Bypassing decades allows coarser resolutions as selected. The Analog Firmware Assembly sends the output count (SER STATUS) to the Front Panel, System Controller Firmware and Frequency Reference Firmware Assemblies and pin 11 on the rear panel FUNCTION Connector.

  The Analog Firmware Assembly also sends the 1 MHz TTL reference to the Log Amp Firmware Assembly through A18J1.

- AM/FM Receiver

  The AM/FM Receiver uses the 10.7 MHz IF signal from the Log Amp Firmware Assembly through A18J6. The Analog Firmware Assembly sends the 10.7 MHz IF signal to the following circuits:

  - AM/FM Detectors (signals ≤5 MHz BW)

    The Analog Firmware Assembly attenuates the 10.7 MHz IF signal according to input from the Automatic Gain Control (AGC) circuit. A fixed gain amplifier increases the level approximately 20 dB before the 10.7 MHz tuned transformer, providing proper impedance, feeds the signal to the AM and FM Detectors.

    The high gain AGC amplifier (AM IF AMPL) provides a balanced output, transformer coupled to the biased Schottky diode AM Detector. The high impedance audio buffer drives both the ac coupled output amplifier, sending the detected AM to the Video Source Select, and the dc coupled AGC Error amplifier to control the input levels and reference for the squelch control.

The FM Detector starts with a combined wide-range limiting amplifier and quadrature detector (FM IF AMPL & DET). The quadrature tank circuit is switched for operation at normal deviations (20 to 200 kHz) or narrow deviations (<20 kHz). The detected FM passes through a 500 kHz Low-Pass Filter, providing minimal carrier filtering to preserve bandwidth. The buffered signal provides dc coupled FM to the Video Source Select (N/A for AN930). The ac coupled output amplifier provides ac coupled FM to the Video Source Select.

- 10.7 MHz IF OUT Connector

  A high impedance buffer and an attenuator provide 0 dB (±2 dB) gain and 50 Ω impedance with <1.5:1 VSWR at 10.7 MHz.

- Quasi-Peak Detector (N/A for AN930)

  For the AN920, AN930A and AN940; the Quasi-Peak Detector uses the 10.7 MHz IF signal.

- Quasi-Peak Detection

For the AN930, the Quasi-Peak Detector uses the LOG VIDEO signal, through A18J2, from the Log Amp Firmware Assembly. All other models use the 10.7 MHz IF signal, through A18J6, from the Log Amp Firmware Assembly. According to model, the Quasi-Peak Detector operates as follows:

- AN930

  The LOG VIDEO signal across the Peak Detector charges an RC circuit at the time constant according to the bandwidth. Refer to Table 2-10. The bandwidth also determines the discharge time. The Sampling Buffer provides unity gain to the Meter Filter. A low-pass filter provides the meter (indicator) time constant. The Quasi-Peak Detector sends the positive polarized Meter Filter output to the Video Source Select.

- AN920, AN930A, AN940

  Two video operational amplifiers increase the level of the 10.7 MHz IF signal to the Peak Detectors. One Peak Detector path provides the 45 ms charge time constant and the other provides the 1 ms charge time constant. The 1 ms charge time path provides the two discharge time constants (160 or 550 ms) available with the 1 ms charge time, according to the bandwidth. Refer to Table 2-10. Both signals are buffered to provide unity gain and sent through the charge time select switch to the Meter Filter. A low-pass filter provides the meter (indicator) time constant. The Quasi-Peak Detector sends the positive polarized Meter Filter output to the Video Source Select.

FREQUENCY RANGE	BANDWIDTH AT 6 dB	CHARGE TIME CONSTANT	DISCHARGE TIME CONSTANT	INDICATOR TIME CONSTANT
10 to 150 kHz	200 Hz	45 ms	500 ms	160 ms
150 kHz to 30 MHz	9 kHz	1 ms	160 ms	160 ms
30 MHz to 1 GHz	120 kHz	1 ms	550 ms	100 ms

Table 2-10 Quasi-Peak Time Constants

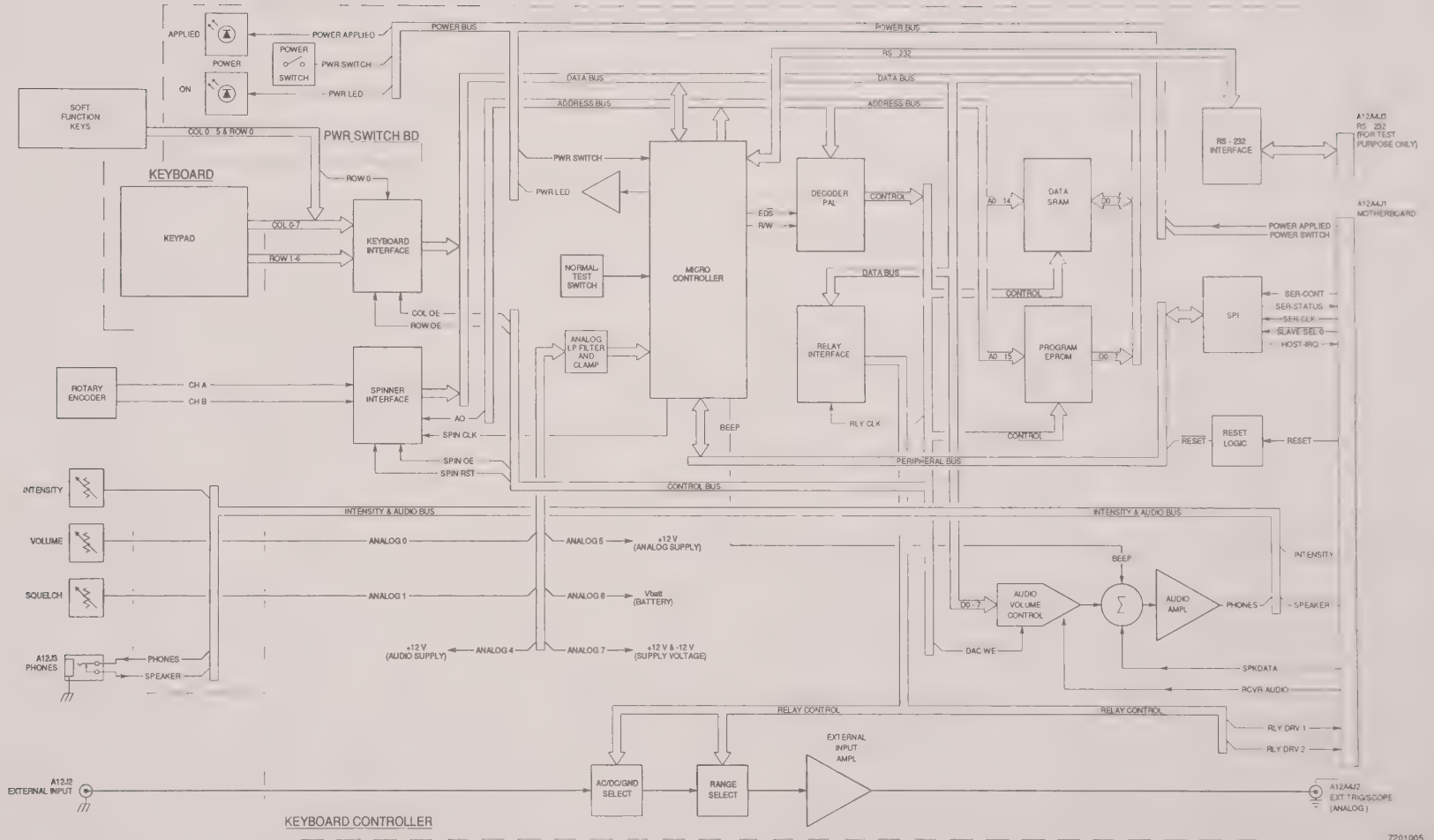


Figure 2-15 Front Panel Assembly Block Diagram

2-4-15 FRONT PANEL ASSEMBLY

The Front Panel Assembly provides the interface between the operator and the AN900 Series Spectrum Analyzer. The Front Panel Assembly, consisting of the Bezel PC Board, Power Switch PC Board, Keyboard PC Board and Keyboard Controller Firmware Assemblies; performs the following functions:

- Power Control and Indication

  The Power Switch PC Board Assembly contains the POWER Switch, POWER ON Indicator and POWER APPLIED Indicator. The POWER APPLIED Indicator illuminates when ac or dc power is applied to the unit. The Front Panel Assembly receives the POWER APPLIED Indicator voltage from the Power Supply Assembly, through the Motherboard PC Board Assembly (A2J1, pin 13) and pin 13 of A12A4J1. Pressing the POWER Switch ON applies power to the unit. The POWER Switch applies a ground on the POWER SWITCH line through pin 14 of A12A4J1 activates the Power Supply Assembly. The +5 V received from the Power Supply Assembly activates the PWR LED Driver on the Keyboard Controller Firmware Assembly. The PWR LED Driver causes the POWER ON Indicator to illuminate. When battery voltage drops below ≈11.7 Vdc, the Microcontroller, on the Keyboard Controller Firmware Assembly, switches the PWR LED Driver on and off at a 1 Hz rate. The POWER ON Indicator flashes to indicate the low battery voltage.

  The Microcontroller monitors the following voltages:

  - +12 V audio supply
  - +12 V analog supply
  - Vbatt (battery)
  - Sum of -12 V and +12 V analog supplies

- Key Monitor

  The Microcontroller monitors the row and column information generated when a Front Panel Assembly key is pressed. The DATA SCROLL ↑ and ↓ Keys, DATA SCROLL ← and → Keys, MODE Keys, FREQUENCY Keys, AMPLITUDE Keys, DATA ENTRY Keypad and MEMORY Keys are on the Keyboard PC Board Assembly. The Soft Function Keys are on the Bezel PC Board Assembly. Each key connects a row and column signal, according to Table 2-11, to provide a signature signal through the Keyboard Interface to the Microcontroller.

- Control Monitor

  The DATA SCROLL Spinner provides increment and decrement functions for editing data. Rotating the DATA SCROLL Spinner generates two square wave voltage signals, CH A and CH B, 90° out of phase with each other. The number of rising edges determines magnitude. Phase difference determines direction. The Spinner Interface converts the voltage signals to a digital data signal for the Microcontroller.

  The INTENSITY Control potentiometer (10 kΩ range) adjusts contrast/brightness of the CRT display. The potentiometer sends a voltage level between ground and +5 V through pin 12 of A12A4J1, to the Video Controller Firmware Assembly.

KEY	ROW	COLUMN	KEY	ROW	COLUMN
DATA SCROLL ↑	2	7	1	4	2
DATA SCROLL →	1	7	2	4	3
DATA SCROLL ↓	1	6	3	4	4
DATA SCROLL ←	2	6	4	5	2
Soft Function F1	0	5	5	5	3
Soft Function F2	0	4	6	5	4
Soft Function F3	0	3	7	6	2
Soft Function F4	0	2	8	6	3
Soft Function F5	0	1	9	6	4
Soft Function F6	0	0	.	3	3
MARKER MODE	2	0	+/-	3	4
SWEEP MODE	2	1	Hz/dB	3	5
GEN MODE	1	0	kHz/m	4	5
AUX MODE	1	1	MHz/μ	5	5
CENTER FREQUENCY	6	0	GHz/n	6	5
SPAN FREQUENCY	6	1	STORE MEMORY	6	6
START FREQUENCY	5	0	RCL MEMORY	6	7
STOP FREQUENCY	5	1	SETUP MEMORY	5	6
ATTEN AMPLITUDE	4	0	LIMITS MEMORY	5	7
GAIN AMPLITUDE	4	1	PLOT MEMORY	4	6
BW AMPLITUDE	3	0	DSPL MEMORY	4	7
SCALE AMPLITUDE	3	1	APPS MEMORY	3	6
0	3	2	CONFIG MEMORY	3	7

Table 2-11 Front Panel Assembly Keys

The VOLUME Control potentiometer (10 kΩ range) adjusts volume of the AM/FM Receiver audio signal (RCVR-AUDIO) from the Analog Firmware Assembly. The potentiometer sends a voltage level between ground and +5 V to the Microcontroller. The Microcontroller digitizes the analog voltage. The resulting data sets the Audio Volume Control DAC and buffer.

The SQUELCH Control potentiometer (10 kΩ range) adjusts the squelch level of the AM/FM Receiver. The potentiometer sends a voltage level between ground and +5 V to the Microcontroller. The Microcontroller digitizes the analog voltage and sends resulting data through the SPI to the System Controller Firmware Assembly. The System Controller Firmware Assembly then sends control data to the Analog Firmware Assembly to set squelch through the Trigger & Squelch Dual DAC.

- Command Processor

The System Controller Firmware Assembly sends commands to the Keyboard Controller Firmware Assembly through the SPI. Commands set software parameters, request status information or set relays used to scale the EXTERNAL (scope) INPUT Connector signal. The Keyboard Controller places commands in a queue and executes commands in the order received.

- Audio Output

  The Front Panel Assembly receives audio from three sources:

  - AM/FM Receiver audio signal (RCVR-AUDIO) from the Analog Firmware Assembly through pin 26 of A12A4J1
  - Error or warning beeps (SPKDATA) from the System Controller Firmware Assembly through pin 22 of A12A4J1
  - Annunciator BEEP from the Microcontroller when a Front Panel Assembly key is pressed (Keyboard Click set to ENABLE in Analyzer Configuration Screen Options Menu) or DATA SCROLL Spinner is adjusted (Spinner Click set to ENABLE in Analyzer Configuration Screen Options Menu)

  An Audio Amplifier drives the audio output (PHONES) to the PHONES Connector (A12J3). If nothing is connected to the PHONES Connector, the Front Panel sends the audio output (SPEAKER) through the Motherboard PC Board Assembly (A2J1, pin 24) to the speaker.

- EXTERNAL INPUT Connector Control

  The Front Panel Assembly receives a trigger, oscilloscope or low frequency (≤24 kHz) signal through the EXTERNAL INPUT Connector (A12J2). The Microcontroller routes the signal through relays providing input coupling and amplitude scaling. Input coupling (AC, DC, or GND), according to Auxiliary Mode Operation Screen EXT IN* setting, uses two relays. Amplitude scaling (÷1, ÷10, ÷100 or ÷1000) also uses two relays. The Front Panel Assembly drives the output EXT TRIG/SCOP (INPUT VIDEO) signal through (A12A4J2) to the Analog Firmware Assembly.

- Relay Drivers

  The Microcontroller also controls the external relay driver lines (RLY DRV1 and RLY DRV2) to the FUNCTION Connector (W40J1, pins 5 and 13). When the Relay function is active in the Limits Memory Operation Screen and the live trace exceeds a displayed Upper Limit trace, the high on pin 13 (RLY DRV2) of W40J1 switches to low. When the Relay function is active in the Limits Memory Operation Screen and the live trace falls below a displayed Lower Limit trace, the high on pin 5 (RLY DRV1) of W40J1 switches to low.

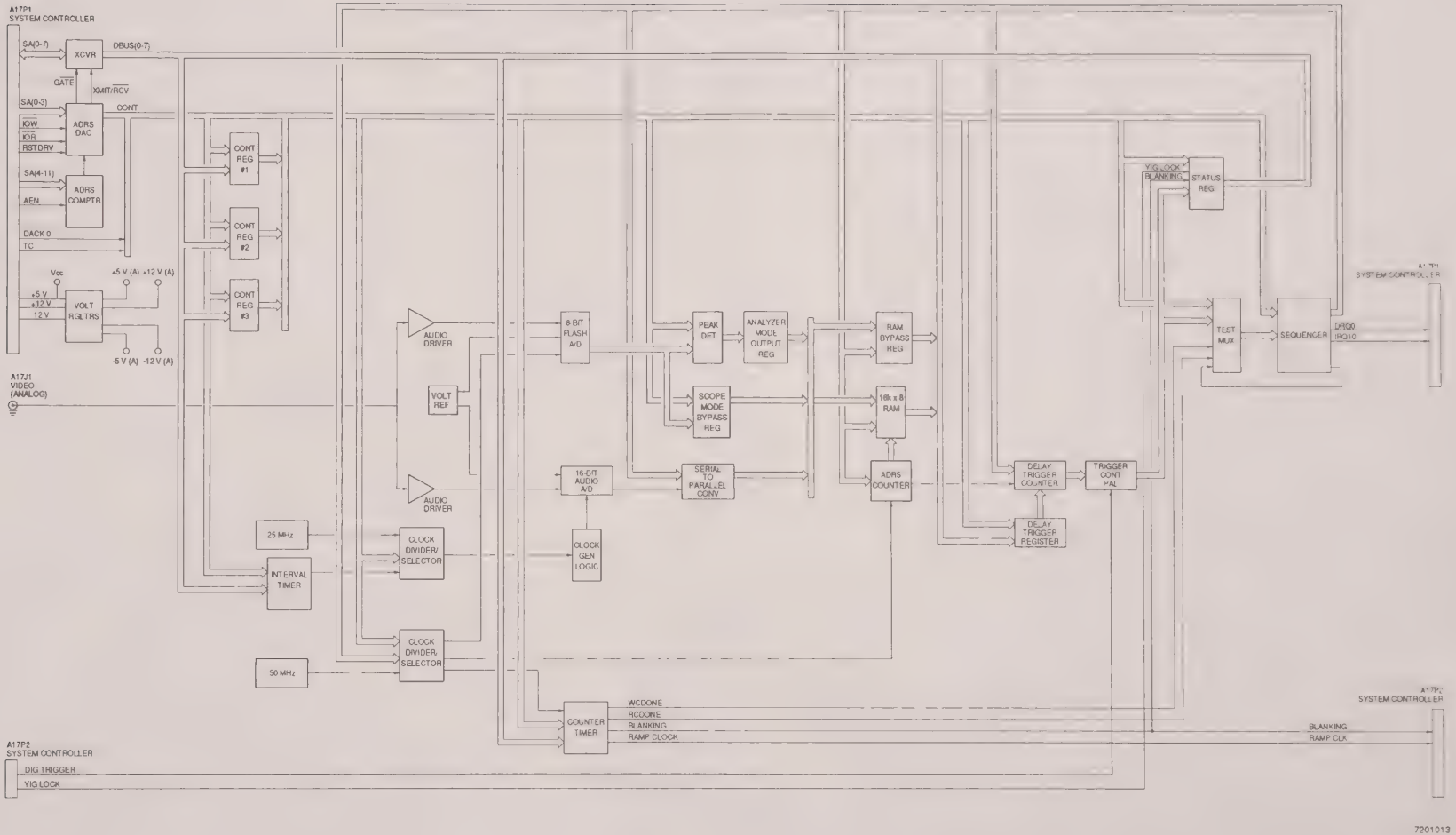


Figure 2-16 Digitizer Firmware Assembly Block Diagram

2-4-16 DIGITIZER FIRMWARE ASSEMBLY

The Digitizer Firmware Assembly serves as a data acquisition system designed to provide a complete, highly integrated solution to a wide range of applications. The Digitizer Firmware Assembly converts analog data into measurable digital data for the System Controller Firmware Assembly to process and generates the signals used to control the sweep operation of the unit. The Digitizer Firmware Assembly performs the functions as follows:

- Data Acquisition

  The Digitizer Firmware Assembly provides two modes of data acquisition from Oscilloscope or Spectrum Analyzer information. The high speed mode samples data up to a maximum rate of 25 MHz with 8 bits of resolution. The lower speed mode samples data at a rate of up to 100 kHz with 16 bits of resolution.

  The Digitizer Firmware Assembly receives the VIDEO input signal from the Analog Firmware Assembly through A17J1. An audio driver sends the signal to an analog-to-digital converter, according to operation. For normal Spectrum Analyzer and Oscilloscope modes, the 8-Bit Flash A/D Converter digitizes the signal at the ≤25 MHz rate. A Peak Detector latches and transfers the current digitized Spectrum Analyzer signal with the highest level to an Analyzer Mode Output Register. (The Peak Detector allows a high rate of digitizing even when the Spectrum Analyzer runs at slower sweep and sample speeds.) In Scope mode, the Digitizer Firmware Assembly latches the digitized data directly to the Scope Mode Bypass Register.

  For audio signals (≤24 kHz) and FFT signals (Frequency Span ≤200 Hz/Div), the 16-Bit Audio A/D Converter digitizes the signal at the ≤100 kHz rate. Shift registers convert the serial output to parallel.

  The Digitizer Firmware Assembly stores the digitized signals in RAM until accessed by the System Controller Firmware Assembly through the Transceiver and NAT-BUS. A Sequencer provides the main control logic for the data acquisition function.

- Sweep Operation

  The Digitizer Firmware Assembly synchronizes the sweep and retrace cycles. A 50 MHz source, divided by a Clock Divider/Selector circuit, provides the input source for a Counter Timer. The Counter Timer contains five programmable timers (Write Clock, Ramp Clock, Blanking, WCDone and RCDone). The System Controller Firmware Assembly provides configuration data and the Sequencer controls the Counter Timer. The BLANKING signal, programmed according to the Sweep Time, goes low at the end of each sweep for the retrace cycle and provides the $\overline{\text{SWEEP HOLD}}$ signal though the Motherboard PC Board Assembly (A2J2, pin 31). When the Digitizer Firmware Assembly receives the YIG LOCK signal from the Sweep Synthesizer Firmware Assembly or YIG Synthesizer Assembly, BLANKING goes high for the sweep cycle. The Digitizer Firmware Assembly sends the RAMP CLOCK (SWEEP CLOCK), also programmed according to the Sweep Time, through the Motherboard PC Board Assembly (A2J2, pin 29) to the Sweep Synthesizer Firmware Assembly.

  DIG TRIGGER from the Analog Firmware Assembly, through the Motherboard PC Board Assembly (A2J2, pin 34), initiates the sweep through the Trigger Control PAL. The Delay Trigger Counter and Register allow for a Trigger Delay (ZERO Span or Scope mode), if set.

The 50 MHz source, divided by the Clock Divider/Selector circuit, also provides the clock for the high speed 8-Bit Flash A/D Converter. A divided 25 MHz source or Interval Timer controlled by the System Controller Firmware Assembly and selected by another Clock Divider/Selector circuit provide the clock for the 16-Bit Audio A/D Converter.

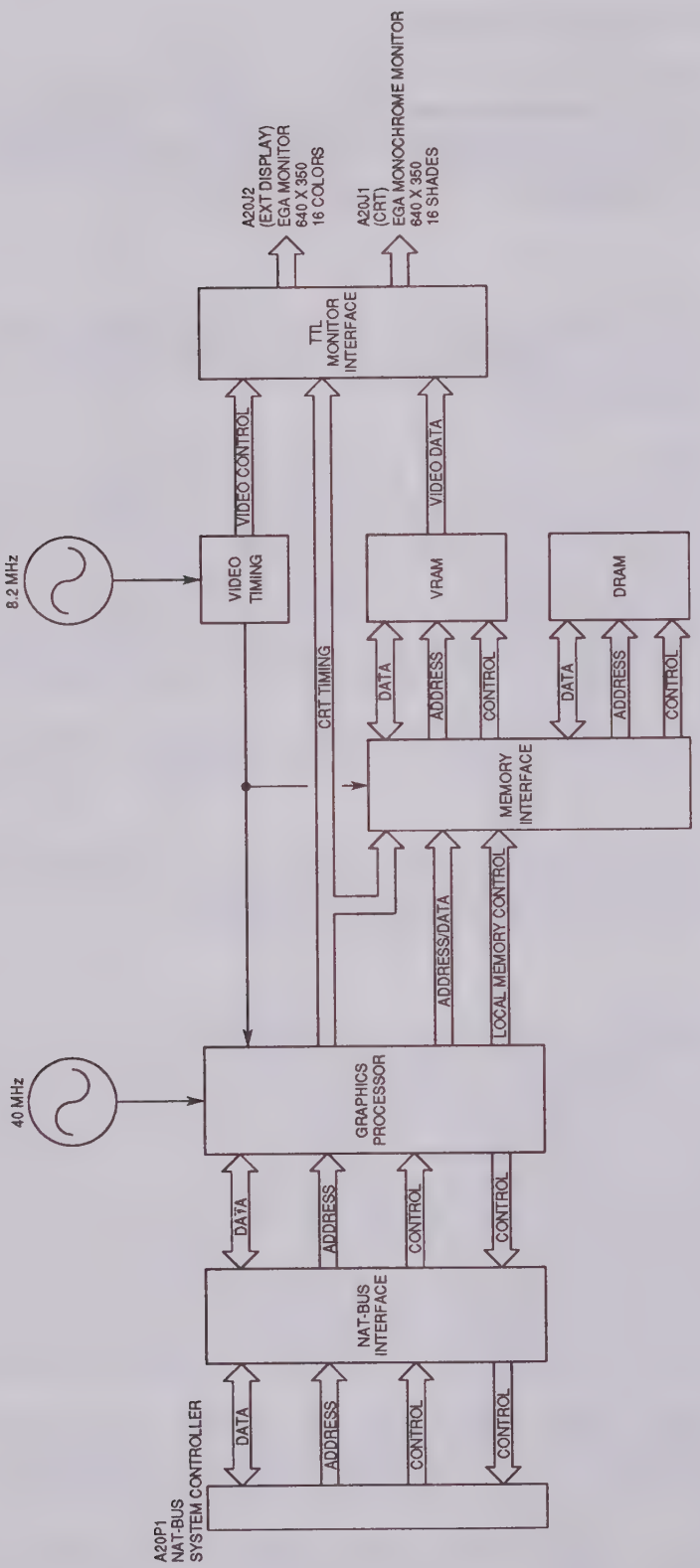


Figure 2-17 Video Controller Firmware Assembly Block Diagram

2-4-17 VIDEO CONTROLLER FIRMWARE ASSEMBLY

The Video Controller Firmware Assembly provides display data for trace and text screens in a timely manner. Processing digital video information and sending the data to the CRT Assembly for display, the Video Controller Firmware Assembly performs the following functions:

- NAT-BUS Interface

  The NAT-BUS Interface provides 16-bit bidirectional data buffering between the NAT-BUS and the Graphics Processor. A DMA interface allows the main CPU on the System Controller Firmware Assembly to write to on-board DRAM through the Graphics Processor ($\overline{\text{DACK6}}$ low). Memory addresses from D7000h to D7FFFh activate the NAT-BUS Interface.

- Graphics Processor

  The TMS34010 Graphics Processor, an advanced 32-bit internal address and 16-bit external address bus microprocessor, is optimized for graphics systems. The Graphics Processor has:

  - Programmable CRT control for horizontal synchronization, vertical synchronization and blanking.
  - Direct communications with the main CPU on the System Controller Firmware Assembly, through the NAT-BUS Interface.
  - Instruction set including special graphics functions (pixel processing, XY addressing and window clipping).
  - 30 general-purpose, 32-bit registers and 256-byte, on-chip instruction cache.

- Memory Interface

  The Video Controller Firmware Assembly contains 512 kilobytes of VRAM for display memory and 512 kilobytes of DRAM for local processing memory. Approximately 179 kilobytes of VRAM are used to display one full screen. Local processing memory holds code or data from the System Controller Firmware Assembly, through the NAT-BUS Interface. The DRAM also stores local variables.

  The Memory Interface provides the row and column address strobe decode, data transfer control signals and latches for reading from or writing to the on-board memory. Data transfers are 16 bits wide.

- TTL Monitor Interface

  The TTL Monitor Interface provides video data for two outputs:

  - Monochromatic EGA monitor signal through A20J1, to the CRT Assembly. Signal contains four bits per pixel data (GSVIDEO), providing 16 levels of gray, with vertical (GSVSYNC) and horizontal (GSHSYNC) control.
  - Color monitor signal through A20J2 and the EXTERNAL DISPLAY Connector (W47J1), to an external EGA monitor. Signal contains four bits per pixel data converted to six outputs (Primary Blue [B], Primary Green [G], Primary Red [R], Secondary Blue [B'], Secondary Green [G'] and Secondary Red [R']), providing 16 colors, with horizontal (BHSYNC) and vertical (BVSYNC) control. Refer to Table 2-12 for color selection.

COLOR	B	G	R	B'	G'	R'	COLOR	B	G	R	B'	G'	R'
Black	0	0	0	0	0	0	Dark Gray	0	0	0	1	1	1
Dark Blue	1	0	0	0	0	0	Blue	1	0	0	1	0	0
Dark Green	0	1	0	0	0	0	Green	0	1	0	0	1	0
Dark Cyan	1	1	0	0	0	0	Cyan	1	1	0	1	1	0
Dark Red	0	0	1	0	0	0	Red	0	0	1	0	0	1
Dark Magenta	1	0	1	0	0	0	Magenta	1	0	1	1	0	1
Brown	0	1	1	0	0	0	Yellow	0	1	1	0	1	1
Light Gray	1	1	1	0	0	0	White	1	1	1	1	1	1

Table 2-12 Color Selection Through EXT DISPLAY Connector (W47J1)

2-4-18 CRT ASSEMBLY

The CRT Assembly receives input signals from the Video Controller Firmware Assembly and +12 Vdc power from the Power Supply Assembly through A7A2J1. The CRT Filter PC Board Assembly and the CRT make up the CRT Assembly. The CRT Filter PC Board Assembly filters the +12 Vdc from the Power Supply Assembly to provide a smooth operating voltage for the CRT. The Master Brightness control (A7A2R1) adjusts the effects of the INTENSITY Control to prevent too high of an intensity from burning out the screen. The CRT receives the GSVIDEO signal from the Video Controller Firmware Assembly on pin 3 of A7A2J1.

2-4-19 TRACKING GENERATOR ASSEMBLY (OPTION 02)

Refer to System Block Diagrams.

The Tracking Generator Assembly provides an output signal synchronized to the frequency of the sweep signal. The Tracking Generator Assembly has two subassemblies, Generator Source and Generator Output, to perform the following functions:

- Frequency Tracking

  The Track Adjust DAC, set in the Tracking Generator Mode Operation Screen or remotely, compensates for any shift in the 20.535 MHz Oscillator output. The 20.535 MHz signal passes through a X5 frequency multiplier for 102.675 MHz, a bandpass filter to reject multiplier harmonics, a X4 frequency multiplier for 410.7 MHz and another bandpass filter to reject multiplier harmonics, before driving the IF input to the first mixer. The 3.2 GHz LO signal, from the RF Receiver Assembly through A22A1J1, filtered by a 3089 MHz Bandpass Filter, drives the LO input to the first mixer.

A 3610.7 MHz Bandpass Filter rejects mixing harmonics in the first mixer RF output. A two-stage amplifier drives the 3610.7 MHz signal through a 4 MHz Low-Pass Filter to the second mixer RF input. The Tracking Generator receives the AUX LO signal from the YIG Synthesizer Assembly through A22J2J3. The coupled down signal, with level adjusted, drives the LO input to the second mixer. The AUX LO signal changes according to the frequency span sweep to provide a second mixer output in sync with the swept frequencies. A 2.9 GHz Low-Pass Filter rejects mixing harmonics in the second mixer IF output. Four amplifiers increase the tracking signal level to counteract signal loss through the mixers and filters. The Tracking Generator Assembly sends the output through A22A2AT1J1 to the TRACKING GENERATOR Connector (W12J1) on the Front Panel Assembly.

- Amplitude Control

The Sweep Attenuator DAC scales the SWEEP signal, received through A22A1J2 from the Sweep Synthesizer Firmware Assembly, to provide a slope correction input to a level comparator. A calibrated fine (1 dB) Level DAC provides the other comparator input. The comparator output and the tracking signal level from the Leveling Detector are the inputs to the Leveler Integrator. The Leveler Integrator output voltage adjusts the IF input level to the first mixer.

The Output Attenuator with 0 to 60 dB of attenuation and the fine (1 dB) Level DAC provide the 0 to -70 dBm Tracking Generator Output Level range, set remotely or in the Tracking Generator Mode Operation Screen.

SECTION 3 - CALIBRATION/VERIFICATION

3-1 GENERAL

3-1-1 CALIBRATION/VERIFICATION SCHEDULE

Calibration/Verification procedures should be performed if one or more of the following conditions exist:

- During the course of normal operation, the AN900 Series Spectrum Analyzer or any major function thereof fails to meet the performance specifications.
- One or more assemblies have been replaced. Perform complete Calibration Procedures (3-6).
- The AN900 Series Spectrum Analyzer fails Verification Procedures (3-4). Perform complete Calibration Procedures (3-6).
- The recommended 12 month calibration/verification interval is due.

3-1-2 TEST PROCEDURES INFORMATION

Verification Procedures (3-4) are written as individual tests. If multiple procedures are performed, keep power on and omit Steps 1 and 2 for each subsequent procedure.

Before making calibration adjustments, always observe the measurement. If the measurement is within the tolerances given, do not make the adjustment. When an adjustment is required, adjust for the best precise measurement, instead of just within tolerance.

NOTE: (For AN930) The Calibration/Verification procedures require Version 1.06 or later operation firmware loaded.

3-1-3 CONTROLS, CONNECTORS AND INDICATORS

Front and rear panel controls, connectors and indicators specified in the Calibration/Verification Procedures are followed by an item number. Refer to Figures 3-1 and 3-2 for location of each control, connector and indicator.

3-1-4 TEST RECORD

Calibration and Verification Data Sheets are provided for recording results obtained while performing the Calibration and/or Verification Procedures. Reproduce copies of the Data Sheets, rather than use the copies in this manual.

3-2 PRECAUTIONS

3-2-1 SAFETY

As with any piece of electronic equipment, extreme caution should be taken when working with "live" circuits. When performing the Calibration/Verification Procedures in this section, observe the following precautions:

WARNING: REMOVE ALL JEWELRY OR OTHER COSMETIC APPAREL BEFORE PERFORMING ANY PROCEDURES INVOLVING "LIVE" CIRCUITS.

WHEN WORKING WITH LIVE CIRCUITS OF HIGH POTENTIAL, KEEP ONE HAND IN POCKET OR BEHIND BACK TO AVOID SERIOUS SHOCK HAZARD.

WARNING: USE ONLY INSULATED TROUBLESHOOTING TOOLS WHEN WORKING WITH LIVE CIRCUITS.

FOR ADDED INSULATION, PLACE RUBBER BENCH MATS UNDERNEATH ALL POWERED BENCH EQUIPMENT AND TECHNICIAN CHAIRS.

HEED ALL WARNINGS AND CAUTIONS CONCERNING MAXIMUM VOLTAGES AND POWER INPUTS

3-2-2 ESD

CAUTION: CALIBRATION PROCEDURES SHOULD ONLY BE PERFORMED IN AN ESD ENVIRONMENT. ALL PERSONNEL PERFORMING THE PROCEDURES SHOULD KNOW ACCEPTED ESD PRACTICES.

3-3 REQUIREMENTS

3-3-1 TEST EQUIPMENT

Appendix B contains a comprehensive list of test equipment suitable for performing any of the procedures listed in this manual. Any other equipment meeting the specifications listed in Appendix B may be substituted in place of the recommended models.

NOTE: For certain procedures in this manual, the equipment listed in Appendix B may exceed the minimum required specifications.

3-3-2 DISASSEMBLY

The Case Assembly must be removed from the AN900 Series Spectrum Analyzer (4-3-1) to perform the Calibration Procedures (3-6). The wire harness cover must be removed from the AN900 Series Spectrum Analyzer (4-3-15, Step 2) to perform the Power Supply Calibration Procedure (3-6-1).

3-3-3 ENVIRONMENT

For best results, the calibration/verification environmental conditions should be identical to the environmental conditions at the normal operating location.

3-3-4 WARM UP

The AN900 Series Spectrum Analyzer requires 15 minutes of stabilization time after switching power On.

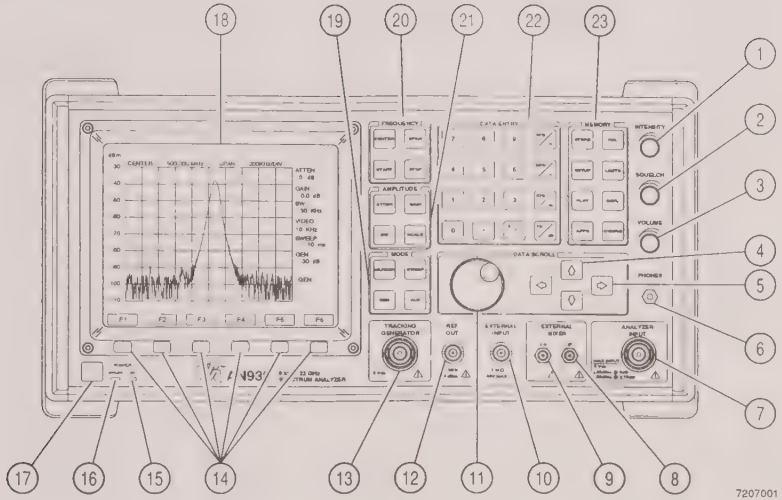


Figure 3-1 Front Panel Controls, Connectors and Indicators

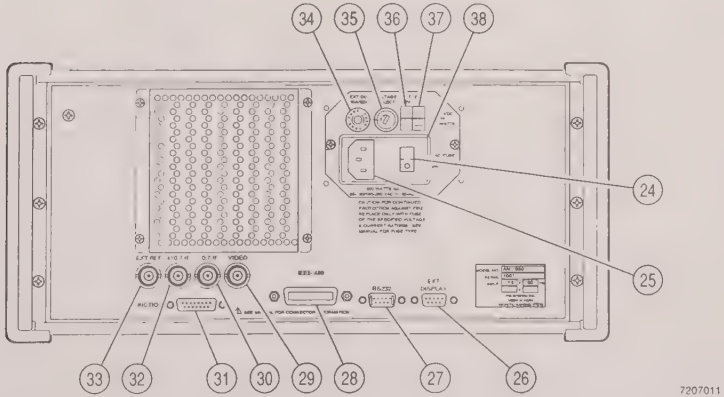


Figure 3-2 Rear Panel Controls, Connectors and Indicators

1. INTENSITY Control
2. SQUELCH Control
3. VOLUME Control
4. DATA SCROLL ↑ and ↓ Keys
5. DATA SCROLL ← and → Keys
6. PHONES Connector
7. ANALYZER INPUT Connector
8. EXTERNAL MIXER IF Connector
9. EXTERNAL MIXER LO Connector
10. EXTERNAL INPUT Connector
11. DATA SCROLL Spinner
12. REF OUT Connector
13. TRACKING GENERATOR Connector (Option 02)
14. Soft Function Keys
15. POWER ON Indicator
16. POWER APPLIED Indicator
17. POWER Switch
18. CRT
19. MODE Keys
20. FREQUENCY Keys
21. AMPLITUDE Keys
22. DATA ENTRY Keypad
23. MEMORY Keys
24. MAIN POWER CUTOFF Switch
25. AC IN Connector
26. EXT DISPLAY Connector
27. RS-232 Connector
28. IEEE-488 GPIB Connector
29. VIDEO OUT Connector
30. 10.7 MHz IF OUT Connector
31. FUNCTION Connector
32. 410.7 MHz IF OUT Connector
33. EXT REF IN Connector
34. EXT DC Fuse
35. AC VOLTAGE SELECT Control
36. BAT IN Connector
37. EXT DC IN Connector
38. AC FUSE Housing

3-4 VERIFICATION PROCEDURES

3-4-1 OUTPUTS

TEST EQUIPMENT:
- 1 100 MHz Amplifier
- 1 100 MHz Low-Pass Filter
- 1 EGA Monitor
- 1 External 10 MHz Reference
- 1 Frequency Counter
- 1 Function Generator
- 1 Headphones
- 1 Oscilloscope
- 1 Power Meter
- 1 Signal Generator
- 1 Spectrum Analyzer

STEP PROCEDURE

1. Apply power to AN900 Series Spectrum Analyzer.
2. Press POWER Switch (17) On. Allow 15 minutes stabilization period.
3. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

REF OUT CONNECTOR (12)

4. Connect Power Meter through 100 MHz Low-Pass Filter to REF OUT Connector (12).
5. Verify signal level + 100 MHz Low-Pass Filter loss is -30 dBm (±0.5 dB). Record signal level + 100 MHz Low-Pass Filter loss.
6. Disconnect Power Meter and 100 MHz Low-Pass Filter from REF OUT Connector (12).
7. Connect External 10 MHz Reference to external Frequency Counter reference input. Connect external Frequency Counter through 100 MHz Amplifier to REF OUT Connector (12).
8. Verify signal frequency is 100 MHz (±2 Hz, High Stability Time Base installed), (±50 Hz, Medium Stability Time Base installed) or (±20 Hz, no off board time base installed). Record frequency.

PHONES CONNECTOR (6)

9. Connect Signal Generator to ANALYZER INPUT Connector (7).
10. Set Signal Generator for 100 MHz CW at -30 dBm with FM of 10 kHz deviation at 1 kHz rate applied.
11. Press AUX MODE Key (19), RCVR* Soft Function Key F1 (14) and FM2 Soft Function Key F4 (14) in succession to activate FM Receiver mode.
12. Connect Headphones to PHONES Connector (6).
13. Adjust SQUELCH Control (2) fully counterclockwise.

STEP	PROCEDURE

14. Adjust VOLUME Control (3) and verify audible tone through Headphones.

15. Adjust SQUELCH Control (2) until tone is no longer audible.

16. Disconnect Headphones from PHONES Connector (6).

17. Press AUX MODE Key (19), RCVR* Soft Function Key F1 (14) and FM2 Soft Function Key F4 (14) in succession to deactivate FM Receiver mode.

18. Remove FM deviation on Signal Generator.

10.7 MHz IF OUT CONNECTOR (30)

19. Press SPAN FREQUENCY Key (20) and ZERO Soft Function Key F1 (14) in succession to set Frequency Span to ***0 Hz/DIV*** or ***ZERO*** (AN930).

20. Press BW AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set BW field to ***30 kHz***.

21. Verify signal on CRT (18).

22. Connect Spectrum Analyzer to 10.7 MHz IF OUT Connector (30).

23. Verify signal at 10.7 MHz at ≈-3 dBm.

24. Disconnect Spectrum Analyzer from 10.7 MHz IF OUT Connector (30).

410.7 MHz IF OUT CONNECTOR (32)

25. Connect Spectrum Analyzer to 410.7 MHz IF OUT Connector (32).

26. Verify signal at 410.7 MHz at ≈-30 dBm.

27. Disconnect Spectrum Analyzer from 410.7 MHz IF OUT Connector (32) and Signal Generator from ANALYZER INPUT Connector (7).

FUNCTION CONNECTOR (31)

28. Press SPAN FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Frequency Span to ***1 MHz/DIV***.

29. Press SWEEP MODE Key (19) and use DATA ENTRY Keypad (22) to set Sweep Time per division to ***1 ms***.

30. Connect external Oscilloscope to SWEEP (pin 14) of FUNCTION Connector (31). Refer to Appendix A, Figure A-2.

31. Verify signal level is 5 V_{P-P} (±0.5 V). Record level.

32. Disconnect Oscilloscope from SWEEP (pin 14) of FUNCTION Connector (31). Connect external Oscilloscope to $\overline{\text{SWEEP HOLD}}$ (pin 6) of FUNCTION Connector (31). Refer to Appendix A, Figure A-2.

STEP	PROCEDURE

33. Verify signal level is 5 V_{P-P} (±0.25 V). Record level.

34. Press AUX MODE Key (19), EXT IN* Soft Function Key F4 (14) and DC Soft Function Key F2 (14) in succession. If necessary, press FFT Soft Function Key F4 (14) to activate Scope mode (SCOPE label above Soft Function Key F4 [14] highlighted). If necessary, press V POS Soft Function Key F5 (14), 0 on Data Entry Keypad (22) and V POS Soft Function Key F5 (14) in succession to set Amplitude Scale Offset to ***0 DIV***.

35. Press SWEEP MODE Key (19) and use DATA ENTRY Keypad (22) to set Sweep Time per division to ***500 µs***.

36. Press SCALE AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set Amplitude Scale per division to ***100 mV***.

37. Connect Function Generator to EXTERNAL INPUT Connector (10).

38. Set Function Generator for 1 kHz sine wave at 800 mV_{P-P}.

39. Disconnect Oscilloscope from $\overline{\text{SWEEP HOLD}}$ (pin 6) of FUNCTION Connector (31). Connect external Oscilloscope to AUX VIDEO (pin 7) of FUNCTION Connector (31). Refer to Appendix A, Figure A-2.

40. Verify signal level is 800 mV_{P-P} (±80 mV). Record level.

EXT DISPLAY CONNECTOR (26)

41. Connect EGA Monitor to EXT DISPLAY Connector (26).

42. Verify EGA Monitor has same display as CRT (18).

43. Disconnect all test equipment.

EXTERNAL MIXER LO CONNECTOR (9)

44. Press AUX MODE Key (19), EXT IN* Soft Function Key F4 (14) and DC Soft Function Key F2 (14) in succession to deactivate Scope mode.

45. (For AN920 only) Press RETURN Soft Function Key F6 (14) and MIXER* Soft Function Key F3 (14), +IF Soft Function Key F3 (14) and ON Soft Function Key F1 (14) in succession to activate External Mixer function.

46. (For AN920 only) Use DATA ENTRY Keypad to set Harmonic field to ***1***.

47. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***3 GHz***.

48. Press SPAN FREQUENCY Key (20) and ZERO Soft Function Key F1 (14) in succession to set Frequency Span to ***0 Hz/DIV*** or ***ZERO*** (AN930).

49. Connect Power Meter to EXTERNAL MIXER LO Connector (9).

50. Verify signal level is ≥+8 dBm. Record level.

STEP PROCEDURE

51. Repeat Step 50 for each Center Frequency listed as follows:

● *3.2 GHz*	● *5.0 GHz*	● *6.8 GHz*	● *8.6 GHz*	● *10.4 GHz*
● *3.4 GHz*	● *5.2 GHz*	● *7.0 GHz*	● *8.8 GHz*	● *10.6 GHz*
● *3.6 GHz*	● *5.4 GHz*	● *7.2 GHz*	● *9.0 GHz*	● *10.8 GHz*
● *3.8 GHz*	● *5.6 GHz*	● *7.4GHz*	● *9.2 GHz*	● *11.0 GHz*
● *4.0 GHz*	● *5.8 GHz*	● *7.6 GHz*	● *9.4 GHz*	● *11.2 GHz*
● *4.2 GHz*	● *6.0 GHz*	● *7.8 GHz*	● *9.6 GHz*	● *11.4 GHz*
● *4.4 GHz*	● *6.2 GHz*	● *8.0 GHz*	● *9.8 GHz*	● *11.6 GHz*
● *4.6 GHz*	● *6.4 GHz*	● *8.2 GHz*	● *10.0 GHz*	● *11.8 GHz*
● *4.8 GHz*	● *6.6 GHz*	● *8.4 GHz*	● *10.2 GHz*	● *12.0 GHz*

52. Remove power and disconnect test equipment.

3-4-2 EXTERNAL INPUT CONNECTOR (10)

TEST EQUIPMENT: 1 Digital Multimeter (DMM)
1 Function Generator
1 Scope Normalizer

STEP PROCEDURE

1. Apply power to AN900 Series Spectrum Analyzer.

2. Press POWER Switch (17) On. Allow 15 minutes stabilization period.

3. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

RESISTIVE IMPEDANCE

4. Press AUX MODE Key (19), EXT IN* Soft Function Key F4 (14) and DC Soft Function Key F2 (14) in succession. If necessary, press FFT Soft Function Key F4 (14) to activate Scope mode (SCOPE label above Soft Function Key F4 [14] highlighted). If necessary, press V POS Soft Function Key F5 (14), 0 on Data Entry Keypad (22) and V POS Soft Function Key F5 (14) in succession to set Amplitude Scale Offset to ***0 DIV***.

5. Press SCALE AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set Amplitude Scale per division to ***100 mV***.

6. Connect DMM to EXTERNAL INPUT Connector (10).

7. Verify resistive impedance is ≈1 MΩ. Record resistive impedance.

8. Repeat Step 7 for ***10 mV*** and ***1 V*** Amplitude Scale per division settings.

9. Disconnect DMM from EXTERNAL INPUT Connector (10).

IMPEDANCE

10. Use DATA ENTRY Keypad (22) to set Amplitude Scale per division to ***100 mV***.

11. Press AUX MODE Key (19), EXT IN* Soft Function Key F4 (14) and AC Soft Function Key F1 (14) in succession.

12. Connect Function Generator through Scope Normalizer to EXTERNAL INPUT Connector (10).

13. Set Function Generator for 1 kHz square wave. Adjust Function Generator level to display signal five divisions peak to peak on CRT (18).

14. Verify normal square wave with <2% overshoot or undershoot.

    NOTE: Overshoot indicates capacitance <27 pF. Undershoot indicates capacitance >27 pF. High distortion indicates resistance >1 MΩ.

15. Repeat Step 14 for ***10 mV*** and ***1 V*** Amplitude Scale per division settings.

SCOPE AMPLITUDE

16. Set Function Generator level to 30 mV_{P-P}.

17. Use DATA ENTRY Keypad (22) to set Amplitude Scale per division to ***5 mV***.

18. Press AUX MODE Key (19), EXT IN* Soft Function Key F4 (14) and DC Soft Function Key F2 (14) in succession.

19. Verify signal display on CRT (18).

20. Press MARKER MODE Key (19) and use DATA SCROLL Spinner (11) to move Marker 1 to positive peak.

21. Press MKR 2 Soft Function Key F2 (14) and use DATA SCROLL Spinner (11) to move Marker 2 to negative peak.

22. Press DELTA Soft Function Key F3 (14) to activate Delta function.

23. Press SWEEP MODE Key (19), MODE* Soft Function Key F2 (14), SNGL Soft Function Key F4 (14) and ARM Soft Function Key F5 (14) in succession to activate Single Sweep function.

24. Press ARM Soft Function Key F5 (14) several times and verify Delta field displays 30 mV (±0.15 mV). Record Delta field reading.

25. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL ↑ Key (4) to set Amplitude Scale per division to ***10 mV***.

26. Set Function Generator level to 60 mV_{P-P}.

27. Press SWEEP MODE Key (19), MODE* Soft Function Key F2 (14) and ARM Soft Function Key F5 (14) in succession.

STEP	PROCEDURE

28. Press ARM Soft Function Key F5 (14) several times and verify Delta field displays 60 mV (±0.3 mV). Record Delta field reading.

29. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL ↑ Key (4) to set Amplitude Scale per division to ***20 mV***.

30. Set Function Generator level to 120 mV_{P-P}.

31. Press SWEEP MODE Key (19), MODE* Soft Function Key F2 (14) and ARM Soft Function Key F5 (14) in succession.

32. Press ARM Soft Function Key F5 (14) several times and verify Delta field displays 120 mV (±0.6 mV). Record Delta field reading.

33. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL ↑ Key (4) to set Amplitude Scale per division to ***50 mV***.

34. Set Function Generator level to 300 mV_{P-P}.

35. Press SWEEP MODE Key (19), MODE* Soft Function Key F2 (14) and ARM Soft Function Key F5 (14) in succession.

36. Press ARM Soft Function Key F5 (14) several times and verify Delta field displays 300 mV (±1.5 mV). Record Delta field reading.

37. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL ↑ Key (4) to set Amplitude Scale per division to ***100 mV***.

38. Set Function Generator level to 600 mV_{P-P}.

39. Press SWEEP MODE Key (19), MODE* Soft Function Key F2 (14) and ARM Soft Function Key F5 (14) in succession.

40. Press ARM Soft Function Key F5 (14) several times and verify Delta field displays 600 mV (±3 mV). Record Delta field reading.

41. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL ↑ Key (4) to set Amplitude Scale per division to ***200 mV***.

42. Set Function Generator level to 1.2 V_{P-P}.

43. Press SWEEP MODE Key (19), MODE* Soft Function Key F2 (14) and ARM Soft Function Key F5 (14) in succession.

44. Press ARM Soft Function Key F5 (14) several times and verify Delta field displays 1.2 V (±6 mV). Record Delta field reading.

45. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL ↑ Key (4) to set Amplitude Scale per division to ***500 mV***.

46. Set Function Generator level to 3 V_{P-P}.

47. Press SWEEP MODE Key (19), MODE* Soft Function Key F2 (14) and ARM Soft Function Key F5 (14) in succession.

48. Press ARM Soft Function Key F5 (14) several times and verify Delta field displays 3 V (±15 mV). Record Delta field reading.

49. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL ↑ Key (4) to set Amplitude Scale per division to ***1 V***.

50. Set Function Generator level to 6 V_{P-P}.

51. Press SWEEP MODE Key (19), MODE* Soft Function Key F2 (14) and ARM Soft Function Key F5 (14) in succession.

52. Press ARM Soft Function Key F5 (14) several times and verify Delta field displays 6 V (±30 mV). Record Delta field reading.

53. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL ↑ Key (4) to set Amplitude Scale per division to ***2 V***.

54. Set Function Generator level to 12 V_{P-P}.

55. Press SWEEP MODE Key (19), MODE* Soft Function Key F2 (14) and ARM Soft Function Key F5 (14) in succession.

56. Press ARM Soft Function Key F5 (14) several times and verify Delta field displays 12 V (±60 mV). Record Delta field reading.

57. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL ↑ Key (4) to set Amplitude Scale per division to ***5 V***.

58. Set Function Generator level to 15 V_{P-P}.

59. Press SWEEP MODE Key (19), MODE* Soft Function Key F2 (14) and ARM Soft Function Key F5 (14) in succession.

60. Press ARM Soft Function Key F5 (14) several times and verify Delta field displays 15 V (±120 mV). Record Delta field reading.

SCOPE BANDWIDTH

61. Press AUTO Soft Function Key F2 (14).

62. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL ↑ Key (4) to set Amplitude Scale per division to ***1 V***.

63. Set Function Generator for 1 kHz sine wave. Adjust Function Generator level to display signal four divisions peak to peak on CRT (18).

64. Increase Function Generator Frequency until signal level displays 2.8 V_{P-P} on CRT (18).

65. Press SWEEP MODE Key (19) and use DATA SCROLL Spinner (11) to reduce Sweep Time, as needed, for best signal display.

66. Verify Function Generator Frequency is ≥5 MHz.

67. Remove power and disconnect all test equipment.

3-4-3 SWEEP TRIGGER

TEST EQUIPMENT: 1 Function Generator

STEP	PROCEDURE

1. Apply power to AN900 Series Spectrum Analyzer.
2. Press POWER Switch (17) On. Allow 15 minutes stabilization period.
3. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

COUPLING

4. Press AUX MODE Key (19), EXT IN* Soft Function Key F4 (14) and AC Soft Function Key F1 (14) in succession. If necessary, press FFT Soft Function Key F4 (14) to activate Scope mode (SCOPE label above Soft Function Key F4 [14] highlighted).
5. Press SWEEP MODE Key (19), MODE* Soft Function Key F2 (14) and NORM Soft Function Key F3 (14) in succession.
6. Press RETURN Soft Function Key F6 (14), SOURCE* Soft Function Key F3 (14) and VIDEO Soft Function Key F1 (14) in succession.
7. Press FILTER Soft Function Key F5 (14) and use DATA SCROLL Spinner (11) to set Filter Select field to ***DC***.
8. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL Spinner (11) to set Amplitude Scale per division to ***5 mV***.
9. Press SWEEP MODE Key (19), TRIG* Soft Function Key F4 (14) and TRIG LVL Soft Function Key F1 (14) in succession. Use DATA SCROLL Spinner (11) to set Trigger Level (horizontal dashed line) to 0 mV.
10. Connect Function Generator to EXTERNAL INPUT Connector (10).
11. Set Function Generator for 1 kHz sine wave at 15 mV_{P-P}.
12. Verify Function Generator signal triggers Digital Oscilloscope signal display on CRT (18).
13. Press AUX MODE Key (19), EXT IN* Soft Function Key F4 (14) and DC Soft Function Key F2 (14) in succession.
14. Verify Function Generator signal triggers Digital Oscilloscope signal display on CRT (18).

INTERNAL SENSITIVITY

15. Press SCALE AMPLITUDE Key (21) and use DATA SCROLL Spinner (11) to set Amplitude Scale per division to ***20 mV***.
16. Set Function Generator for 1 kHz sine wave at 100 mV_{P-P}.
17. Decrease Function Generator level, adjusting dc offset to maintain 0 V dc reference, to lowest level where display still updates on CRT (18).

18. Verify Function Generator level is ≤20 mV_P. Record level.

EXTERNAL INPUT CONNECTOR (10) SENSITIVITY

19. Press AUX MODE Key (19), EXT IN* Soft Function Key F4 (14) and DC Soft Function Key F2 (14) in succession.

20. Press SPAN FREQUENCY Key (20) and ZERO Soft Function Key F1 (14) in succession to set Frequency Span to ***0 Hz/DIV*** or ***ZERO*** (AN930).

21. Press SWEEP MODE Key (19) and use DATA ENTRY Keypad (22) to set Sweep Time per division to ***1 ms***.

22. Press SOURCE* Soft Function Key F3 (14) and EXT FRNT Soft Function Key F3 (14) in succession.

23. Press RETURN Soft Function Key F6 (14), TRIG* Soft Function Key F4 (14) and TRIG LVL Soft Function Key F1 (14) in succession. Use DATA SCROLL Spinner (11) to set Trigger Level field (lower right side of display below SWEEP) to ***0.0 V***.

24. Set Function Generator signal level to 250 mV_P.

25. Decrease Function Generator level to lowest level where display still updates on CRT (18).

26. Verify Function Generator level is ≤200 mV_P. Record level.

27. Disconnect Function Generator from EXTERNAL INPUT Connector (10).

FUNCTION CONNECTOR (31) SENSITIVITY

28. Press RETURN Soft Function Key F6 (14), SOURCE* Soft Function Key F3 (14) and EXT REAR Soft Function Key F4 (14) in succession.

29. Connect Function Generator to AUX TRIGGER (pin 8) of FUNCTION Connector (31). Refer to Appendix A, Figure A-2.

30. Set Function Generator for 1 kHz sine wave at 3 V_{P-P}.

31. Decrease Function Generator level to lowest level where display still updates on CRT (18).

32. Verify Function Generator level is ≤2 V_{P-P}. Record level.

33. Disconnect Function Generator from AUX TRIGGER (pin 8) of FUNCTION Connector (34).

BANDWIDTH

34. Press EXT FRNT Soft Function Key F3 (14).

35. Connect Function Generator to EXTERNAL INPUT Connector (10).

36. Set Function Generator signal for 1 kHz sine wave at twice the level recorded in Step 26.

STEP	PROCEDURE

37. Increase Function Generator frequency to highest frequency where display still updates on CRT (18).

38. Verify Function Generator frequency is ≥5 MHz. Record frequency.

39. Remove power and disconnect test equipment.

3-4-4 EXTERNAL MIXER IF CONNECTOR (8)

TEST EQUIPMENT: 1 Signal Generator

STEP	PROCEDURE

1. Apply power to AN900 Series Spectrum Analyzer.

2. Press POWER Switch (17) On. Allow 15 minutes stabilization period.

3. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

4. Press AUX MODE Key (19), MIXER* Soft Function Key F3 (14) and ON Soft Function Key F1 (14) in succession to activate External Mixer function.

5. Press SPAN FREQUENCY Key (20). Use DATA ENTRY Keypad (22) to set Frequency Span to ***10 kHz/DIV***.

6. Press BW AMPLITUDE (21) and VIDEO Soft Function Key F1 (14) in succession. Use DATA ENTRY Keypad (22) to set Video Bandwidth to ***10 kHz***.

7. Press SCALE AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set Amplitude Scale per division to ***1 dB***.

8. Connect Signal Generator to EXTERNAL MIXER IF Connector (8).

9. Set Signal Generator for 410.7 MHz CW at -30 dBm.

10. Adjust Signal Generator level until display on CRT (18) indicates -30 dBm.

11. Verify Signal Generator level is -30 dBm (±3 dB). Record level.

12. Press AUX MODE Key (19), MIXER* Soft Function Key F3 (14) and ON Soft Function Key F1 (14) in succession to deactivate External Mixer function.

13. Remove power and disconnect test equipment.

3-4-5 AMPLITUDE

TEST EQUIPMENT: 1 50 Ω Termination
2 Microwave Signal Generators
1 Power Splitter

STEP PROCEDURE

1. Apply power to AN900 Series Spectrum Analyzer.
2. Press POWER Switch (17) On. Allow 15 minutes stabilization period.
3. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

AVERAGE NOISE LEVEL

4. Terminate ANALYZER INPUT Connector (7) with 50 Ω Termination.
5. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***9 kHz***.
6. Press SPAN FREQUENCY Key (20). Use DATA ENTRY Keypad (22) to set Frequency Span to ***1 kHz/DIV***.
7. Press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal gain to ***20.0 dB***.
8. Press BW AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set BW field to ***300 Hz***.
9. Press VIDEO Soft Function Key F1 (14) and use DATA ENTRY Keypad (22) to set Video Bandwidth to ***10 Hz***.
10. Verify noise level according to model in Table 3-1. Record level.
11. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency, according to model, to each frequency listed in Table 3-1. Verify and record noise level for each Center Frequency.
12. (For AN920, AN930A and AN940) Press SPAN FREQUENCY Key (20). Use DATA ENTRY Keypad (22) to set Frequency Span to ***20 Hz/DIV***.
13. (For AN920, AN930A and AN940) Press BW AMPLITUDE (21) and use DATA ENTRY Keypad (22) to set BW field to ***3 Hz***.
14. (For AN920, AN930A and AN940) Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency, according to model, to each frequency listed in Table 3-1. Verify and record noise level for each Center Frequency.
15. Remove 50 Ω Termination from ANALYZER INPUT Connector (7).

CENTER FREQUENCY	MODELS	NOISE LEVEL (300 Hz RBW, 10 Hz VBW)	NOISE LEVEL (3 Hz RBW)
9 kHz	AN930	≤-70 dBm	N/A
	All Others	≤-95 dBm	≤-115 dBm
60 kHz	AN930	≤-70 dBm	N/A
	All Others	≤-95 dBm	≤-115 dBm
100 kHz	AN930	≤-70 dBm	N/A
	All Others	≤-95 dBm	≤-115 dBm
101 kHz	AN930	≤-100 dBm	N/A
	All Others	≤-115 dBm	≤-135 dBm
10 MHz	AN930	≤-100 dBm	N/A
	All Others	≤-115 dBm	≤-135 dBm
11 MHz	AN930	≤-115 dBm	N/A
	All Others	≤-115 dBm	≤-135 dBm
2.9 GHz	AN930	≤-115 dBm	N/A
	All Others	≤-115 dBm	≤-135 dBm
3 GHz	AN930	≤-110 dBm	N/A
	AN930A/AN940	≤-110 dBm	≤-130 dBm
7.5 GHz	AN930	≤-110 dBm	N/A
	AN930A/AN940	≤-110 dBm	≤-130 dBm
12 GHz	AN930	≤-110 dBm	N/A
	AN930A/AN940	≤-110 dBm	≤-130 dBm
13 GHz	AN930	≤-100 dBm	N/A
	AN930A/AN940	≤-105 dBm	≤-125 dBm
17 GHz	AN930	≤-100 dBm	N/A
	AN930A/AN940	≤-105 dBm	≤-125 dBm
22 GHz	AN930	≤-100 dBm	N/A
	AN930A/AN940	≤-105 dBm	≤-125 dBm
26.5 GHz	AN940	≤-105 dBm	≤-125 dBm

Table 3-1 Average Noise Level

GAIN COMPRESSION

16. Press SPAN FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Frequency Span to ***100 kHz/DIV***.

17. Press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set gain to ***0.0 dB***.

18. Press SCALE AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set Amplitude Scale per division to ***1 dB***.

19. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***10 MHz***.

20. Connect test equipment according to Figure 3-3.

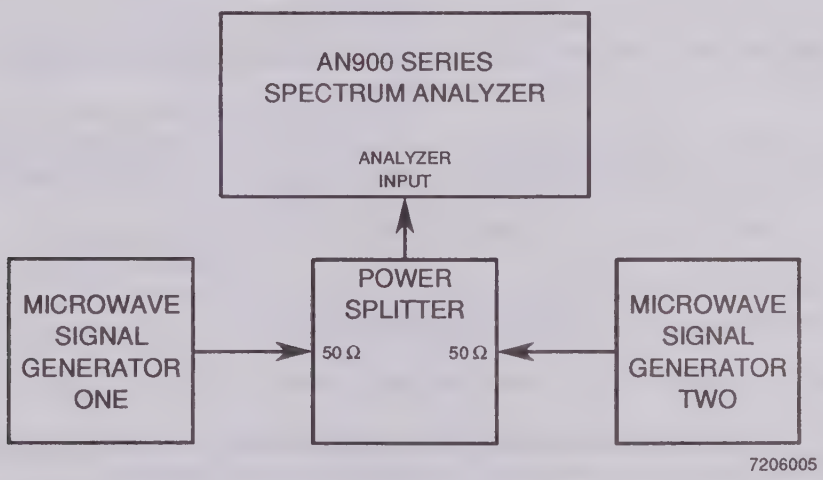


Figure 3-3 Gain Compression Test Setup Diagram

21. Disable Microwave Signal Generator Two output.

22. Set Microwave Signal Generator One to Center Frequency at level producing -30 dBm top of graticule indication on CRT (18).

23. Set Microwave Signal Generator Two >3 MHz above Center Frequency.

24. Enable Microwave Signal Generator Two. Increase Microwave Signal Generator Two level until signal level at Center Frequency drops 1 dB on CRT (18).

25. Verify Microwave Signal Generator Two level (input level to AN900 ANALYZER INPUT Connector [7]) is ≥-10 dBm (AN930) or ≥-5 dBm (all others). Record level. Reduce Microwave Signal Generator Two level.

26. Repeat Steps 21 through 25, for each Center Frequency setting as follows: ***100 MHz*** and (For AN930, AN930A and AN940) ***2 GHz***, ***4 GHz*** and ***15 GHz***. Peak preselector in Gain Amplitude Operation Screen as needed.

27. Remove power and disconnect test equipment.

3-4-6 FREQUENCY COUNTER

TEST EQUIPMENT: 1 External 10 MHz Reference
1 Signal Generator

STEP PROCEDURE

1. Apply power to AN900 Series Spectrum Analyzer.
2. Press POWER Switch (17) On. Allow 15 minutes stabilization period.
3. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

ACCURACY

4. Connect External 10 MHz Reference to EXT REF IN Connector (33) and Signal Generator reference input.
5. Press CONFIG MEMORY Key (23), 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Options Menu.
6. Press 9 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to edit REFERENCE. Use DATA SCROLL ↑ and ↓ Keys (4) to set REFERENCE to ***EXT***.
7. Connect Signal Generator to ANALYZER INPUT Connector (7).
8. Press SPAN FREQUENCY Key (20) and ZERO Soft Function Key F1 (14) in succession to set Frequency Span to ***0 Hz/DIV*** or ***ZERO*** (AN930).
9. Set Signal Generator for 100 MHz CW at -30 dBm.
10. Press AUX MODE Key (19), CTR* Soft Function Key F2 (14) and 100 Hz Soft Function Key F3 (14) in succession to activate Frequency Counter function.
11. Verify CTR field indicates 100.0000 MHz (±100 Hz).
12. Press 10 Hz Soft Function Key F2 (14).
13. Verify CTR field indicates 100.00000 MHz (±10 Hz).
14. Press 1 Hz Soft Function Key F1 (14).
15. Verify CTR field indicates 100.000000 MHz (±1 Hz).

SENSITIVITY

16. Press BW AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set BW field to ***5 MHz***.
17. Decrease Signal Generator level until CTR field changes ±5 Hz.
18. Verify Signal Generator level is ≤-65 dBm. Record level.

STEP	PROCEDURE

19. Press BW AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set BW field to ***3 kHz***.

20. Press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal gain to ***10.0 dB***.

21. Decrease Signal Generator level until CTR field changes ±5 Hz.

22. Verify Signal Generator level is ≤-85 dBm. Record level.

23. Press AUX MODE Key (19), CTR* Soft Function Key F2 (14) and 1 Hz Soft Function Key F3 (14) in succession to deactivate Frequency Counter function.

24. Press CONFIG MEMORY Key (23), 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Options Menu.

25. Press 9 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to edit REFERENCE. Use DATA SCROLL ↑ and ↓ Keys (4) to set REFERENCE to ***INT***.

26. Remove power and disconnect test equipment.

3-4-7 RECEIVER SENSITIVITY

TEST EQUIPMENT: 1 Measuring Receiver
1 Signal Generator

STEP	PROCEDURE

1. Apply power to AN900 Series Spectrum Analyzer.

2. Press POWER Switch (17) On. Allow 15 minutes stabilization period.

3. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

FM

4. Press AUX MODE Key (19), RCVR* Soft Function Key F1 (14) and FM1 Soft Function Key F3 (14) in succession to activate FM Receiver mode.

5. Press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal gain to ***10.0 dB***.

6. Connect Signal Generator to ANALYZER INPUT Connector (7).

7. Set Signal Generator for 100 MHz CW at -30 dBm with FM of 5 kHz deviation at 1 kHz rate applied.

8. Connect Measuring Receiver to PHONES Connector (6).

9. Decrease Signal Generator RF level until Measuring Receiver indicates 10 dB SINAD.

10. Verify Signal Generator RF level is ≤5 µV. Record level in µV.

STEP PROCEDURE

11. Disconnect Measuring Receiver from PHONES Connector (6).

12. Press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal gain to ***0.0 dB***.

AM

13. Set Signal Generator for 100 MHz CW at -30 dBm with 30% AM deviation at 1 kHz rate applied.

14. Press AUX MODE Key (19), RCVR* Soft Function Key F1 (14) and AM2 Soft Function Key F2 (14) in succession to activate AM Receiver mode.

15. Verify audio through internal speaker indicates AM detector operation.

16. Press AM2 Soft Function Key F2 (14) to deactivate AM Receiver mode.

17. Remove power and disconnect test equipment.

3-4-8 FREQUENCY STABILITY

TEST EQUIPMENT: 1 2.8 GHz PDRO Circuit
1 11.9 GHz PDRO Circuit
1 18 GHz PDRO Circuit
1 Low Noise Signal Generator

STEP PROCEDURE

1. Apply power to AN900 Series Spectrum Analyzer.

2. Press POWER Switch (17) On. Allow 15 minutes stabilization period.

3. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

4. Press SPAN FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Frequency Span to ***5 kHz/DIV***.

5. Press ATTEN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal attenuation to ***30 dB***.

6. Press BW AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set BW field to ***3 kHz***.

7. Press VIDEO Soft Function Key F1 (14) and use DATA ENTRY Keypad (22) to set Video Bandwidth to ***10 Hz***.

8. Press CONFIG MEMORY Key (23), 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Options Menu.

9. Press 4 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to edit TRACE AVERAGING. Use DATA SCROLL ↑ and ↓ Keys (4) to set TRACE AVERAGING to ***8***.

STEP	PROCEDURE

10. Press ENTER Soft Function Key F1 (14). Press 8 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to edit TIME CALIBRATION. Use DATA SCROLL ↑ and ↓ Keys (4) to set TIME CALIBRATION to ***DISABLE***.

11. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***100.015 MHz***.

12. Connect Low Noise Signal Generator to ANALYZER INPUT Connector (7).

13. Set Low Noise Signal Generator for 100 MHz CW at 0 dBm.

14. Press ATTEN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal attenuation for displaying signal within 1/2 major division of top of graticule. If needed, press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set gain for displaying signal within 1/2 major division of top of graticule.

15. Press DSPL MEMORY Key (23) and AVG Soft Function Key F1 (14) to activate Trace Averaging function.

16. Press MARKER MODE Key (19) and PEAK* Soft Function Key F5 (14). Press PEAK > Soft Function Key F2 (14) repeatedly until Marker 1 is tracking 100 MHz input signal peak.

17. Press RETURN Soft Function Key F6 (14), MKR 2 Soft Function Key F2 (14) and DELTA Soft Function Key F3 (14).

18. Use DATA ENTRY Keypad (22) to set Marker 2 to ***100.01 MHz***. Use DATA SCROLL ↑ and ↓ Keys (4) or DATA SCROLL Spinner (11) to set Marker 2 to 10 kHz above Marker 1 (input signal) frequency (Delta field frequency difference=10 kHz).

19. Verify Delta field amplitude difference + 34.8 dB is ≥97 dB (translates to ≤-97 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.

    NOTE: The correction factor, 34.8 dB, converts the reading with a 3 kHz RBW to the equivalent measurement with a 1 Hz RBW.

20. Use DATA SCROLL ↑ and ↓ Keys (4), DATA SCROLL ← and → Keys (5) and/or DATA SCROLL Spinner (11) to set Marker 2 to 30 kHz above Marker 1 (input signal) frequency (Delta field frequency difference=30 kHz).

21. Verify amplitude difference + 34.8 dB is ≥101 dB (translates to ≤-101 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.

22. Press MTRK Soft Function Key F4 (14) to activate Marker Track function.

23. Press DSPL MEMORY Key (23) and AVG Soft Function Key F1 (14) to deactivate Trace Averaging function.

24. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***1.000015 GHz***.

25. Set Low Noise Signal Generator for 1 GHz CW at 0 dBm.

26. Press ATTEN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal attenuation for displaying signal within 1/2 major division of top of graticule. If needed, press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set gain for displaying signal within 1/2 major division of top of graticule.

27. Press DSPL MEMORY Key (23) and AVG Soft Function Key F1 (14) to activate Trace Averaging function.

28. Press MARKER MODE Key (19) and PEAK* Soft Function Key F5 (14). Press PEAK > Soft Function Key F2 (14) repeatedly until Marker 1 is tracking 1 GHz input signal peak.

29. Verify Delta field amplitude difference + 34.8 dB is ≥95 dB (translates to ≤-95 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.

30. Press RETURN Soft Function Key F6 (14), MTRK Soft Function Key F4 (14) and MKR 2 Soft Function Key F2 (14).

31. Use DATA SCROLL ↑ and ↓ Keys (4), DATA SCROLL ← and → Keys (5) and/or DATA SCROLL Spinner (11) to set Marker 2 to 10 kHz above Marker 1 (input signal) frequency (Delta field frequency difference=10 kHz).

32. Verify Delta field amplitude difference + 34.8 dB is ≥92 dB (translates to ≤-92 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.

33. Press MTRK Soft Function Key F4 (14) to activate Marker Track function.

34. Press DSPL MEMORY Key (23) and AVG Soft Function Key F1 (14) to deactivate Trace Averaging function.

35. Disconnect Low Noise Signal Generator from ANALYZER INPUT Connector (7).

36. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***2.800015 GHz***.

    NOTE: (For AN930, AN940 and AN940) The AN900 Series Spectrum Analyzer should be operating in Band 0. If in doubt, press SPAN FREQUENCY Key (20) and BAND Soft Function Key F2 (14). The Frequency Span field indicates band operation. If not in Band 0, press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***1 GHz***. Press PREV Soft Function Key F5 (14) to reset Center Frequency to ***2.800015 GHz***.

37. Connect 2.8 GHz PDRO Circuit to ANALYZER INPUT Connector (7).

38. Press ATTEN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal attenuation for displaying signal within 1/2 major division of top of graticule. If needed, press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set gain for displaying signal within 1/2 major division of top of graticule.

39. Press DSPL MEMORY Key (23) and AVG Soft Function Key F1 (14) to activate Trace Averaging function.

40. Press MARKER MODE Key (19) and PEAK* Soft Function Key F5 (14). Press PEAK > Soft Function Key F2 (14) repeatedly until Marker 1 is tracking 2.8 GHz input signal peak.

41. Verify Delta field amplitude difference + 34.8 dB is ≥92 dB (translates to ≤-92 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.

42. Press RETURN Soft Function Key F6 (14), MTRK Soft Function Key F4 (14) and MKR 2 Soft Function Key F2 (14).

43. Use DATA SCROLL ↑ and ↓ Keys (4), DATA SCROLL ← and → Keys (5) and/or DATA SCROLL Spinner (11) to set Marker 2 to 30 kHz above Marker 1 (input signal) frequency (Delta field frequency difference=30 kHz).

44. Verify Delta field amplitude difference + 34.8 dB is ≥95 dB (translates to ≤-95 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.

    NOTE: Steps 45 through 75 do not apply to AN920.

45. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***5 GHz*** to set operation to Band 1.

46. Press PREV Soft Function Key F5 (14) to set Center Frequency to ***2.80015 GHz*** in Band 1.

47. Verify Delta field amplitude difference + 34.8 dB is ≥100 dB (translates to ≤-100 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.

48. Press MARKER MODE Key (19) and MKR 2 Soft Function Key F2 (14).

49. Use DATA SCROLL ↑ and ↓ Keys (4), DATA SCROLL ← and → Keys (5) and/or DATA SCROLL Spinner (11) to set Marker 2 to 10 kHz above Marker 1 (input signal) frequency (Delta field frequency difference=10 kHz).

50. Verify Delta field amplitude difference + 34.8 dB is ≥93 dB (translates to ≤-93 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.

51. Press MTRK Soft Function Key F4 (14) to activate Marker Track function.

52. Press DSPL MEMORY Key (23) and AVG Soft Function Key F1 (14) to deactivate Trace Averaging function.

53. Disconnect 2.8 GHz PDRO Circuit from ANALYZER INPUT Connector (7).

54. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***11.900015 GHz***.

    NOTE: The AN900 Series Spectrum Analyzer should be operating in Band 1. If in doubt, press SPAN FREQUENCY Key (20) and BAND Soft Function Key F2 (14). The Frequency Span field indicates band operation. If not in Band 1, press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***5 GHz***. Press PREV Soft Function Key F5 (14) to reset Center Frequency to ***11.900015 GHz***.

55. Connect 11.9 GHz PDRO Circuit to ANALYZER INPUT Connector (7).

STEP	PROCEDURE

56. Press ATTEN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal attenuation for displaying signal within 1/2 major division of top of graticule. If needed, press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set gain for displaying signal within 1/2 major division of top of graticule.

57. Press DSPL MEMORY Key (23) and AVG Soft Function Key F1 (14) to activate Trace Averaging function.

58. Press MARKER MODE Key (19) and PEAK* Soft Function Key F5 (14). Press PEAK > Soft Function Key F2 (14) repeatedly until Marker 1 is tracking 11.9 GHz input signal peak.

59. Verify Delta field amplitude difference + 34.8 dB is ≥88 dB (translates to ≤-88 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.

60. Press RETURN Soft Function Key F6 (14), MTRK Soft Function Key F4 (14) and MKR 2 Soft Function Key F2 (14).

61. Use DATA SCROLL ↑ and ↓ Keys (4), DATA SCROLL ← and → Keys (5) and/or DATA SCROLL Spinner (11) to set Marker 2 to 30 kHz above Marker 1 (input signal) frequency (Delta field frequency difference=30 kHz).

62. Verify Delta field amplitude difference + 34.8 dB is ≥95 dB (translates to ≤-95 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.

63. Press MTRK Soft Function Key F4 (14) to activate Marker Track function.

64. Press DSPL MEMORY Key (23) and AVG Soft Function Key F1 (14) to deactivate Trace Averaging function.

65. Disconnect 11.9 GHz PDRO Circuit from ANALYZER INPUT Connector (7).

66. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***18.000015 GHz***.

67. Connect 18 GHz PDRO Circuit to ANALYZER INPUT Connector (7).

68. Press ATTEN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal attenuation for displaying signal within 1/2 major division of top of graticule. If needed, press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set gain for displaying signal within 1/2 major division of top of graticule.

69. Press DSPL MEMORY Key (23) and AVG Soft Function Key F1 (14) to activate Trace Averaging function.

70. Press MARKER MODE Key (19) and PEAK* Soft Function Key F5 (14). Press PEAK > Soft Function Key F2 (14) repeatedly until Marker 1 is tracking 18 GHz input signal peak.

71. Verify amplitude difference + 34.8 dB is ≥88 dB (translates to ≤-88 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.

72. Press RETURN Soft Function Key F6 (14), MTRK Soft Function Key F4 (14) and MKR 2 Soft Function Key F2 (14).

STEP	PROCEDURE

73. Use DATA SCROLL ↑ and ↓ Keys (4), DATA SCROLL ← and → Keys (5) and/or DATA SCROLL Spinner (11) to set Marker 2 to 10 kHz above Marker 1 (input signal) frequency (Delta field frequency difference=10 kHz).
74. Verify Delta field amplitude difference + 34.8 dB is ≥81 dB (translates to ≤-81 dBc/Hz). Record amplitude difference as negative amount dBc/Hz.
75. Remove power and disconnect test equipment.

3-4-9 TRACKING GENERATOR (OPTION 02)

TEST EQUIPMENT: 1 Power Meter
1 Spectrum Analyzer

STEP	PROCEDURE

1. Apply power to AN900 Series Spectrum Analyzer.
2. Press POWER Switch (17) On. Allow 15 minutes stabilization period.
3. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

HARMONICS

4. Press SPAN FREQUENCY Key (20) and ZERO Soft Function Key F1 (14) in succession to set Frequency Span to ***0 Hz/DIV*** or ***ZERO*** (AN930).
5. Press GEN MODE Key (19) and ON Soft Function Key F1 (14) to activate Tracking Generator operation.
6. Use DATA ENTRY Keypad (22) to set Tracking Generator Output Level field to ***0 dB***.
7. Connect Spectrum Analyzer to TRACKING GENERATOR Connector (13).
8. Verify levels of second and third harmonic spurious are <-20 dBc. Record levels.
9. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***1 MHz***.
10. Verify levels of second and third harmonic spurious are <-20 dBc. Record levels.
11. Use DATA ENTRY Keypad (22) to set Center Frequency to ***10 MHz***.
12. Verify levels of second and third harmonic spurious are <-20 dBc. Record levels.
13. Use DATA ENTRY Keypad (22) to set Center Frequency to ***100 MHz***.
14. Verify levels of second and third harmonic spurious are <-20 dBc. Record levels.
15. Use DATA ENTRY Keypad (22) to set Center Frequency to ***1 GHz***.
16. Verify levels of second and third harmonic spurious are <-20 dBc. Record levels.

17. Use DATA ENTRY Keypad (22) to set Center Frequency to ***2.9 GHz***.

18. Verify levels of second and third harmonic spurious are <-20 dBc. Record levels.

19. Disconnect Spectrum Analyzer from TRACKING GENERATOR Connector (13).

FLATNESS

20. Press GEN MODE Key (19) and use DATA ENTRY Keypad (22) to set Tracking Generator Output Level field to ***-10 dB***.

21. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***100 kHz***.

22. Connect Power Meter (using Power Sensor according to tested frequency) to TRACKING GENERATOR Connector (13).

23. Measure and record output level.

24. Repeat Step 23 for each Center Frequency listed as follows:

- ***200 kHz***
- ***300 kHz***
- ***400 kHz***
- ***500 kHz***
- ***600 kHz***
- ***700 kHz***
- ***800 kHz***
- ***900 kHz***
- ***1 MHz***

25. Verify difference between highest level and lowest level recorded between 100 kHz and 1 MHz Center Frequency settings is ≤2 dB.

26. Repeat Step 23 for each Center Frequency listed as follows:

- ***1 MHz***
- ***10 MHz***
- ***50 MHz***
- ***100 MHz***
- ***200 MHz***
- ***300 MHz***
- ***400 MHz***
- ***500 MHz***
- ***600 MHz***
- ***700 GHz***
- ***800 MHz***
- ***900 MHz***
- ***1.0 GHz***
- ***1.1 GHz***
- ***1.2 GHz***
- ***1.3 GHz***
- ***1.4 GHz***
- ***1.5 GHz***
- ***1.6 GHz***
- ***1.7 kHz***
- ***1.8 GHz***
- ***1.9 GHz***
- ***2.0 GHz***
- ***2.1 GHz***
- ***2.2 GHz***
- ***2.3 GHz***
- ***2.4 GHz***
- ***2.5 GHz***
- ***2.6 GHz***
- ***2.7 GHz***
- ***2.8 GHz***
- ***2.9 GHz***

27. Verify difference between highest level and lowest level recorded between 1 MHz and 2.9 GHz Center Frequency settings is ≤1.5 dB.

ATTENUATOR ACCURACY

28. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***100 kHz***.

29. Press GEN MODE Key (19) and use DATA ENTRY Keypad (22) to set Tracking Generator Output Level field to ***0 dB***.

30. Measure and record output level.

31. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-1 dB***.

STEP	PROCEDURE

32. Verify output level equals Step 30 level - 1 dB (±1 dB). Record level.
33. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-2 dB***.
34. Verify output level equals Step 30 level - 2 dB (±1 dB). Record level.
35. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-3 dB***.
36. Verify output level equals Step 30 level - 3 dB (±1 dB). Record level.
37. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-4 dB***.
38. Verify output level equals Step 30 level - 4 dB (±1 dB). Record level.
39. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-5 dB***.
40. Verify output level equals Step 30 level - 5 dB (±1 dB). Record level.
41. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-6 dB***.
42. Verify output level equals Step 30 level - 6 dB (±1 dB). Record level.
43. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-7 dB***.
44. Verify output level equals Step 30 level - 7 dB (±1 dB). Record level.
45. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-8 dB***.
46. Verify output level equals Step 30 level - 8 dB (±1 dB). Record level.
47. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-9 dB***.
48. Verify output level equals Step 30 level - 9 dB (±1 dB). Record level.
49. Disconnect Microwave Power Meter from TRACKING GENERATOR Connector (13).
50. Connect Spectrum Analyzer to TRACKING GENERATOR Connector (13).
51. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-10 dB***.
52. Measure and record amplitude level as -10 dBm reference.
53. Press DATA SCROLL ← Key (5) and DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-20 dB***.
54. Verify output level equals Step 52 level - 10 dB (±1 dB). Record level.
55. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-30 dB***.
56. Verify output level equals Step 52 level - 20 dB (±1 dB). Record level.
57. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-40 dB***.

STEP	PROCEDURE

58. Verify output level equals Step 52 level - 30 dB (±1.5 dB). Record level.
59. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-50 dB***.
60. Verify output level equals Step 52 level - 40 dB (±2.0 dB). Record level.
61. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-60 dB***.
62. Verify output level equals Step 52 level - 50 dB (±2.5 dB). Record level.
63. Press DATA SCROLL ↓ Key (4) to set Tracking Generator Output Level field to ***-70 dB***.
64. Verify output level equals Step 52 level - 60 dB (±3 dB). Record level.
65. Disconnect Spectrum Analyzer from TRACKING GENERATOR Connector (13).
66. Connect Microwave Power Meter to TRACKING GENERATOR Connector (13).
67. Repeat Steps 29 through 66 for each Center Frequency listed as follows:
    - ***1 MHz***
    - ***100 MHz***
    - ***1 GHz***
    - ***2.9 GHz***
68. Remove power and disconnect test equipment.

3-5 VERIFICATION DATA SHEET

Technician: _____ S/N: _____

Model: _____ Date: _____

STEP	DATA	RESULT

3-4-1 OUTPUTS

REF OUT CONNECTOR (12)

5. Signal Level + 100 MHz Low-Pass Filter loss -30 dBm (-30.5 to -29.5 dBm) _____

8. Signal Frequency 100 MHz (99.000008 to 100.000002 MHz, High Stability Time Base), (99.00005 to 100.00005 MHz, Medium Stability Time Base) or (99.00008 to 100.00002 MHz, No External Time Base) _____

PHONES CONNECTOR (6)

14. PHONES Connector operates. _____ (√)

10.7 MHz IF OUT CONNECTOR (30)

21. Signal displays on CRT (18). _____ (√)

23. Signal is at 10.7 MHz (≈-3 dBm). _____ (√)

410.7 MHz IF OUT CONNECTOR (32)

26. Signal is at 410.7 MHz (≈-30 dBm). _____ (√)

FUNCTION CONNECTOR (31)

31. SWEEP (pin 14) 5 V_{P-P} (4.5 to 5.5 V_{P-P}) _____

33. $\overline{\text{SWEEP HOLD}}$ (pin 6) 5 V_{P-P} (4.75 to 5.25 V_{P-P}) _____

40. AUX VIDEO (pin 7) 800 mV_{P-P} (720 to 880 mV_{P-P}) _____

EXT DISPLAY CONNECTOR (26)

42. EGA Monitor has same display as CRT (18). _____ (√)

STEP	DATA	RESULT
	EXTERNAL MIXER LO CONNECTOR (9)	
50.	3.0 GHz Center Frequency/3.4107 GHz YIG Frequency ≥+8 dBm	_____
51.	3.2 GHz Center Frequency/3.6107 GHz YIG Frequency ≥+8 dBm	_____
	3.4 GHz Center Frequency/3.8107 GHz YIG Frequency ≥+8 dBm	_____
	3.6 GHz Center Frequency/4.0107 GHz YIG Frequency ≥+8 dBm	_____
	3.8 GHz Center Frequency/4.2107 GHz YIG Frequency ≥+8 dBm	_____
	4.0 GHz Center Frequency/4.4107 GHz YIG Frequency ≥+8 dBm	_____
	4.2 GHz Center Frequency/4.6107 GHz YIG Frequency ≥+8 dBm	_____
	4.4 GHz Center Frequency/4.8107 GHz YIG Frequency ≥+8 dBm	_____
	4.6 GHz Center Frequency/5.0107 GHz YIG Frequency ≥+8 dBm	_____
	4.8 GHz Center Frequency/5.2107 GHz YIG Frequency ≥+8 dBm	_____
	5.0 GHz Center Frequency/5.4107 GHz YIG Frequency ≥+8 dBm	_____
	5.2 GHz Center Frequency/5.6107 GHz YIG Frequency ≥+8 dBm	_____
	5.4 GHz Center Frequency/5.8107 GHz YIG Frequency ≥+8 dBm	_____
	5.6 GHz Center Frequency/6.0107 GHz YIG Frequency ≥+8 dBm	_____
	5.8 GHz Center Frequency/6.2107 GHz YIG Frequency ≥+8 dBm	_____
	6.0 GHz Center Frequency/6.4107 GHz YIG Frequency ≥+8 dBm	_____
	6.2 GHz Center Frequency/6.6107 GHz YIG Frequency ≥+8 dBm	_____
	6.4 GHz Center Frequency/6.8107 GHz YIG Frequency ≥+8 dBm	_____
	6.6 GHz Center Frequency/7.0107 GHz YIG Frequency ≥+8 dBm	_____
	6.8 GHz Center Frequency/7.2107 GHz YIG Frequency ≥+8 dBm	_____
	7.0 GHz Center Frequency/7.4107 GHz YIG Frequency ≥+8 dBm	_____
	7.2 GHz Center Frequency/7.6107 GHz YIG Frequency ≥+8 dBm	_____
	7.4 GHz Center Frequency/7.8107 GHz YIG Frequency ≥+8 dBm	_____
	7.6 GHz Center Frequency/8.0107 GHz YIG Frequency ≥+8 dBm	_____
	7.8 GHz Center Frequency/8.2107 GHz YIG Frequency ≥+8 dBm	_____
	8.0 GHz Center Frequency/8.4107 GHz YIG Frequency ≥+8 dBm	_____

STEP	DATA	RESULT
51. (Cont)	8.2 GHz Center Frequency/8.6107 GHz YIG Frequency ≥+8 dBm	_____
	8.4 GHz Center Frequency/8.8107 GHz YIG Frequency ≥+8 dBm	_____
	8.6 GHz Center Frequency/9.0107 GHz YIG Frequency ≥+8 dBm	_____
	8.8 GHz Center Frequency/9.2107 GHz YIG Frequency ≥+8 dBm	_____
	9.0 GHz Center Frequency/9.4107 GHz YIG Frequency ≥+8 dBm	_____
	9.2 GHz Center Frequency/9.6107 GHz YIG Frequency ≥+8 dBm	_____
	9.4 GHz Center Frequency/9.8107 GHz YIG Frequency ≥+8 dBm	_____
	9.6 GHz Center Frequency/10.0107 GHz YIG Frequency ≥+8 dBm	_____
	9.8 GHz Center Frequency/10.2107 GHz YIG Frequency ≥+8 dBm	_____
	10.0 GHz Center Frequency/10.4107 GHz YIG Frequency ≥+8 dBm	_____
	10.2 GHz Center Frequency/10.6107 GHz YIG Frequency ≥+8 dBm	_____
	10.4 GHz Center Frequency/10.8107 GHz YIG Frequency ≥+8 dBm	_____
	10.6 GHz Center Frequency/11.0107 GHz YIG Frequency ≥+8 dBm	_____
	10.8 GHz Center Frequency/11.2107 GHz YIG Frequency ≥+8 dBm	_____
	11.0 GHz Center Frequency/11.4107 GHz YIG Frequency ≥+8 dBm	_____
	11.2 GHz Center Frequency/11.6107 GHz YIG Frequency ≥+8 dBm	_____
	11.4 GHz Center Frequency/11.8107 GHz YIG Frequency ≥+8 dBm	_____
	11.6 GHz Center Frequency/12.0107 GHz YIG Frequency ≥+8 dBm	_____
	11.8 GHz Center Frequency/12.2107 GHz YIG Frequency ≥+8 dBm	_____
	12.0 GHz Center Frequency/12.4107 GHz YIG Frequency ≥+8 dBm	_____

3-4-2 EXTERNAL INPUT CONNECTOR (10)

RESISTIVE IMPEDANCE

7.	100 mV per division Amplitude Scale ≈1 MΩ	_____
	10 mV per division Amplitude Scale ≈1 MΩ	_____
	1 V per division Amplitude Scale ≈1 MΩ	_____

STEP	DATA	RESULT
	IMPEDANCE	
14.	100 mV per division Amplitude Scale - CRT (18) displays square wave with <2% overshoot or undershoot.	_____
	10 mV per division Amplitude Scale - CRT (18) displays square wave with <2% overshoot or undershoot.	_____
	1 V per division Amplitude Scale - CRT (18) displays square wave with <2% overshoot or undershoot.	_____
	SCOPE AMPLITUDE	
19.	Signal displays on CRT (18).	_____ (√)
24.	5 mV per division Amplitude Scale 30 mV (29.85 to 30.15 mV)	_____
28.	10 mV per division Amplitude Scale 60 mV (59.7 to 60.3 mV)	_____
32.	20 mV per division Amplitude Scale 120 mV (119.4 to 120.6 mV)	_____
36.	50 mV per division Amplitude Scale 300 mV (298.5 to 301.5 mV)	_____
40.	100 mV per division Amplitude Scale 600 mV (597 to 603 mV)	_____
44.	200 mV per division Amplitude Scale 1.2 V (1194 to 1206 mV)	_____
48.	500 mV per division Amplitude Scale 3 V_{P-P} (2085 to 3015 mV_{P-P})	_____
52.	1 V per division Amplitude Scale 6 V_{P-P} (5970 to 6030 mV_{P-P})	_____
56.	2 V per division Amplitude Scale 12 V_{P-P} (11940 to 12060 mV_{P-P})	_____
60.	5 V per division Amplitude Scale 15 V_{P-P} (14880 to 15120 mV_{P-P})	_____
	SCOPE BANDWIDTH	
66.	≥5 MHz	_____

3-4-3 SWEEP TRIGGER

	COUPLING	
12.	Sweep trigger operates using ac coupling.	_____ (√)
14.	Sweep trigger operates using dc coupling.	_____ (√)

STEP	DATA	RESULT
	INTERNAL SENSITIVITY	
18.	≤20 mV_P	_____
	EXTERNAL INPUT CONNECTOR (10) SENSITIVITY	
26.	≤200 mV_P	_____
	FUNCTION CONNECTOR (31) SENSITIVITY	
32.	≤2 V_{P-P}	_____
	BANDWIDTH	
38.	≥5 MHz	_____
3-4-4	EXTERNAL MIXER IF CONNECTOR (8)	
11.	Signal Level -30 dBm (-33 to -27 dBm)	_____
3-4-5	AMPLITUDE	
	AVERAGE NOISE LEVEL	
10.	9 kHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-70 dBm (AN930), ≤-95 dBm (All Others)	_____
11.	60 kHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-70 dBm (AN930), ≤-95 dBm (All Others)	_____
	100 kHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-70 dBm (AN930), ≤-95 dBm (All Others)	_____
	101 kHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-100 dBm (AN930), ≤-115 dBm (All Others)	_____
	10 MHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-100 dBm (AN930), ≤-115 dBm (All Others)	_____
	11 MHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-115 dBm	_____
	2.9 GHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-115 dBm	_____
	(N/A for AN920) 3 GHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-110 dBm	_____
	(N/A for AN920) 7.5 GHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-110 dBm	_____
	(N/A for AN920) 12 GHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-110 dBm	_____

STEP	DATA	RESULT
11. (Cont)	(N/A for AN920) 13 GHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-100 dBm (AN930), ≤-105 dBm (AN930A, AN940)	_____
	(N/A for AN920) 17 GHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-100 dBm (AN930), ≤-105 dBm (AN930A, AN940)	_____
	(N/A for AN920) 22 GHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-100 dBm (AN930), ≤-105 dBm (AN930A, AN940)	_____
	(AN940 Only) 26.5 GHz Center Frequency, 300 Hz RBW, 10 Hz VBW ≤-105 dBm	_____
14.	(N/A for AN930) 9 kHz Center Frequency, 3 Hz RBW ≤-115 dBm	_____
	(N/A for AN930) 60 kHz Center Frequency, 3 Hz RBW ≤-115 dBm	_____
	(N/A for AN930) 100 kHz Center Frequency, 3 Hz RBW ≤-115 dBm	_____
	(N/A for AN930) 101 kHz Center Frequency, 3 Hz RBW ≤-135 dBm	_____
	(N/A for AN930) 10 MHz Center Frequency, 3 Hz RBW ≤-135 dBm	_____
	(N/A for AN930) 11 MHz Center Frequency, 3 Hz RBW ≤-135 dBm	_____
	(N/A for AN930) 2.9 GHz Center Frequency, 3 Hz RBW ≤-135 dBm	_____
	(N/A for AN920, AN930) 3 GHz Center Frequency, 3 Hz RBW ≤-130 dBm	_____
	(N/A for AN920, AN930) 7.5 GHz Center Frequency, 3 Hz RBW ≤-130 dBm	_____
	(N/A for AN920, AN930) 12 GHz Center Frequency, 3 Hz RBW ≤-130 dBm	_____
	(N/A for AN920, AN930) 13 GHz Center Frequency, 3 Hz RBW ≤-125 dBm	_____
	(N/A for AN920, AN930) 17 GHz Center Frequency, 3 Hz RBW ≤-125 dBm	_____
	(N/A for AN920, AN930) 22 GHz Center Frequency, 300 Hz RBW, ≤-125 dBm	_____
	(AN940 Only) 26.5 GHz Center Frequency, 3 Hz RBW ≤-125 dBm	_____

STEP	DATA	RESULT

GAIN COMPRESSION

25. 10 MHz Center Frequency
≥-10 dBm (AN930), ≥-5 dBm (All Others) _____

100 MHz Center Frequency
≥-10 dBm (AN930), ≥-5 dBm (All Others) _____

(N/A for AN920) 2 GHz Center Frequency
≥-10 dBm (AN930), ≥-5 dBm (AN930A, AN940) _____

(N/A for AN920) 4 GHz Center Frequency
≥-10 dBm (AN930), ≥-5 dBm (AN930A, AN940) _____

(N/A for AN920) 15 GHz Center Frequency
≥-10 dBm (AN930), ≥-5 dBm (AN930A, AN940) _____

3-4-6 FREQUENCY COUNTER

ACCURACY

11. 100 Hz Resolution 100.0000 MHz (99.9999 to 100.0001 MHz) _____

13. 10 Hz Resolution 100.00000 MHz (99.99999 to 100.00001 MHz) _____

15. 1 Hz Resolution 100.000000 MHz (99.999999 to 100.000001 MHz) _____

SENSITIVITY

18. 5 MHz RBW ≤-65 dBm _____

22. 3 kHz RBW ≤-85 dBm _____

3-4-7 RECEIVER SENSITIVITY

FM

10. ≤5 µV _____

AM

15. AM detector operates. _____ (√)

3-4-8 FREQUENCY STABILITY

19. 100 MHz, 10 kHz Offset ≤-97 dBc/Hz _____

21. 100 MHz, 30 kHz Offset ≤-101 dBc/Hz _____

29. 1 GHz, 30 kHz Offset ≤-95 dBc/Hz _____

32. 1 GHz, 10 kHz Offset ≤-92 dBc/Hz _____

STEP	DATA	RESULT
41.	2.8 GHz (Band 0), 10 kHz Offset ≤-92 dBc/Hz	_____
44.	2.8 GHz (Band 0), 30 kHz Offset ≤-95 dBc/Hz	_____
47.	(N/A for AN920) 2.8 GHz (Band 1), 30 kHz Offset ≤-100 dBc/Hz	_____
50.	(N/A for AN920) 2.8 GHz (Band 1), 10 kHz Offset ≤-93 dBc/Hz	_____
59.	(N/A for AN920) 11.9 GHz (Band 1), 10 kHz Offset ≤-88 dBc/Hz	_____
62.	(N/A for AN920) 11.9 GHz (Band 1), 30 kHz Offset ≤-95 dBc/Hz	_____
71.	(N/A for AN920) 18 GHz, 30 kHz Offset ≤-88 dBc/Hz	_____
74.	(N/A for AN920) 18 GHz, 10 kHz Offset ≤-81 dBc/Hz	_____

3-4-9 TRACKING GENERATOR

HARMONICS

8.	100 kHz Center Frequency second harmonic spurious <-20 dBc	_____
	100 kHz Center Frequency third harmonic spurious <-20 dBc	_____
10.	1 MHz Center Frequency second harmonic spurious <-20 dBc	_____
	1 MHz Center Frequency third harmonic spurious <-20 dBc	_____
12.	10 MHz Center Frequency second harmonic spurious <-20 dBc	_____
	10 MHz Center Frequency third harmonic spurious <-20 dBc	_____
14.	100 MHz Center Frequency second harmonic spurious <-20 dBc	_____
	100 MHz Center Frequency third harmonic spurious <-20 dBc	_____
16.	1 GHz Center Frequency second harmonic spurious <-20 dBc	_____
	1 GHz Center Frequency third harmonic spurious <-20 dBc	_____
18.	2.9 GHz Center Frequency second harmonic spurious <-20 dBc	_____
	2.9 GHz Center Frequency third harmonic spurious <-20 dBc	_____

FLATNESS

23.	100 kHz Center Frequency output level -10 dBm	_____
24.	200 kHz Center Frequency output level -10 dBm	_____
	300 kHz Center Frequency output level -10 dBm	_____
	400 kHz Center Frequency output level -10 dBm	_____

STEP	DATA	RESULT
24. (Cont)	500 kHz Center Frequency output level -10 dBm	_____
	600 kHz Center Frequency output level -10 dBm	_____
	700 kHz Center Frequency output level -10 dBm	_____
	800 kHz Center Frequency output level -10 dBm	_____
	900 kHz Center Frequency output level -10 dBm	_____
	1 MHz Center Frequency output level -10 dBm	_____
25.	Difference between highest and lowest lowest levels in Steps 23 and 24 ≤2 dB	_____
26.	1 MHz Center Frequency output level -10 dBm	_____
	10 MHz Center Frequency output level -10 dBm	_____
	50 MHz Center Frequency output level -10 dBm	_____
	100 MHz Center Frequency output level -10 dBm	_____
	200 MHz Center Frequency output level -10 dBm	_____
	300 MHz Center Frequency output level -10 dBm	_____
	400 MHz Center Frequency output level -10 dBm	_____
	500 MHz Center Frequency output level -10 dBm	_____
	600 MHz Center Frequency output level -10 dBm	_____
	700 MHz Center Frequency output level -10 dBm	_____
	800 MHz Center Frequency output level -10 dBm	_____
	900 MHz Center Frequency output level -10 dBm	_____
	1.0 GHz Center Frequency output level -10 dBm	_____
	1.1 GHz Center Frequency output level -10 dBm	_____
	1.2 GHz Center Frequency output level -10 dBm	_____
	1.3 GHz Center Frequency output level -10 dBm	_____
	1.4 GHz Center Frequency output level -10 dBm	_____
	1.5 GHz Center Frequency output level -10 dBm	_____
	1.6 GHz Center Frequency output level -10 dBm	_____

STEP	DATA	RESULT
26. (Cont)	1.7 GHz Center Frequency output level -10 dBm	_____
	1.8 GHz Center Frequency output level -10 dBm	_____
	1.9 GHz Center Frequency output level -10 dBm	_____
	2.0 GHz Center Frequency output level -10 dBm	_____
	2.1 GHz Center Frequency output level -10 dBm	_____
	2.2 GHz Center Frequency output level -10 dBm	_____
	2.3 GHz Center Frequency output level -10 dBm	_____
	2.4 GHz Center Frequency output level -10 dBm	_____
	2.5 GHz Center Frequency output level -10 dBm	_____
	2.6 GHz Center Frequency output level -10 dBm	_____
	2.7 GHz Center Frequency output level -10 dBm	_____
	2.8 GHz Center Frequency output level -10 dBm	_____
	2.9 GHz Center Frequency output level -10 dBm	_____
27.	Difference between highest and lowest lowest levels in Step 26 ≤1.5 dB	_____
	ATTENUATOR ACCURACY	
30.	100 kHz Center Frequency output level 0 dBm reference	_____
(68.)	1 MHz Center Frequency output level 0 dBm reference	_____
(68.)	100 MHz Center Frequency output level 0 dBm reference	_____
(68.)	1 GHz Center Frequency output level 0 dBm reference	_____
(68.)	2.9 GHz Center Frequency output level 0 dBm reference	_____
32.	100 kHz Center Frequency output level -1 dBm (-2 to 0 dBm)	_____
(68.)	1 MHz Center Frequency output level -1 dBm (-2 to 0 dBm)	_____
(68.)	100 MHz Center Frequency output level -1 dBm (-2 to 0 dBm)	_____
(68.)	1 GHz Center Frequency output level -1 dBm (-2 to 0 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -1 dBm (-2 to 0 dBm)	_____

STEP	DATA	RESULT
34.	100 kHz Center Frequency output level -2 dBm (-3 to -1 dBm)	_____
(68.)	1 MHz Center Frequency output level -2 dBm (-3 to -1 dBm)	_____
(68.)	100 MHz Center Frequency output level -2 dBm (-3 to -1 dBm)	_____
(68.)	1 GHz Center Frequency output level -2 dBm (-3 to -1 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -2 dBm (-3 to -1 dBm)	_____
36.	100 kHz Center Frequency output level -3 dBm (-4 to -2 dBm)	_____
(68.)	1 MHz Center Frequency output level -3 dBm (-4 to -2 dBm)	_____
(68.)	100 MHz Center Frequency output level -3 dBm (-4 to -2 dBm)	_____
(68.)	1 GHz Center Frequency output level -3 dBm (-4 to -2 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -3 dBm (-4 to -2 dBm)	_____
38.	100 kHz Center Frequency output level -4 dBm (-5 to -3 dBm)	_____
(68.)	1 MHz Center Frequency output level -4 dBm (-5 to -3 dBm)	_____
(68.)	100 MHz Center Frequency output level -4 dBm (-5 to -3 dBm)	_____
(68.)	1 GHz Center Frequency output level -4 dBm (-5 to -3 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -4 dBm (-5 to -3 dBm)	_____
40.	100 kHz Center Frequency output level -5 dBm (-6 to -4 dBm)	_____
(68.)	1 MHz Center Frequency output level -5 dBm (-6 to -4 dBm)	_____
(68.)	100 MHz Center Frequency output level -5 dBm (-6 to -4 dBm)	_____
(68.)	1 GHz Center Frequency output level -5 dBm (-6 to -4 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -5 dBm (-6 to -4 dBm)	_____
42.	100 kHz Center Frequency output level -6 dBm (-7 to -5 dBm)	_____
(68.)	1 MHz Center Frequency output level -6 dBm (-7 to -5 dBm)	_____
(68.)	100 MHz Center Frequency output level -6 dBm (-7 to -5 dBm)	_____
(68.)	1 GHz Center Frequency output level -6 dBm (-7 to -5 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -6 dBm (-7 to -5 dBm)	_____

STEP	DATA	RESULT
44.	100 kHz Center Frequency output level -7 dBm (-8 to -6 dBm)	_____
(68.)	1 MHz Center Frequency output level -7 dBm (-8 to -6 dBm)	_____
(68.)	100 MHz Center Frequency output level -7 dBm (-8 to -6 dBm)	_____
(68.)	1 GHz Center Frequency output level -7 dBm (-8 to -6 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -7 dBm (-8 to -6 dBm)	_____
46.	100 kHz Center Frequency output level -8 dBm (-9 to -7 dBm)	_____
(68.)	1 MHz Center Frequency output level -8 dBm (-9 to -7 dBm)	_____
(68.)	100 MHz Center Frequency output level -8 dBm (-9 to -7 dBm)	_____
(68.)	1 GHz Center Frequency output level -8 dBm (-9 to -7 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -8 dBm (-9 to -7 dBm)	_____
48.	100 kHz Center Frequency output level -9 dBm (-10 to -8 dBm)	_____
(68.)	1 MHz Center Frequency output level -9 dBm (-10 to -8 dBm)	_____
(68.)	100 MHz Center Frequency output level -9 dBm (-10 to -8 dBm)	_____
(68.)	1 GHz Center Frequency output level -9 dBm (-10 to -8 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -9 dBm (-10 to -8 dBm)	_____
52.	100 kHz Center Frequency output level -10 dBm reference	_____
(68.)	1 MHz Center Frequency output level -10 dBm reference	_____
(68.)	100 MHz Center Frequency output level -10 dBm reference	_____
(68.)	1 GHz Center Frequency output level -10 dBm reference	_____
(68.)	2.9 GHz Center Frequency output level -10 dBm reference	_____
54.	100 kHz Center Frequency output level -20 dBm (-21 to -19 dBm)	_____
(68.)	1 MHz Center Frequency output level -20 dBm (-21 to -19 dBm)	_____
(68.)	100 MHz Center Frequency output level -20 dBm (-21 to -19 dBm)	_____
(68.)	1 GHz Center Frequency output level -20 dBm (-21 to -19 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -20 dBm (-21 to -19 dBm)	_____

STEP	DATA	RESULT
56.	100 kHz Center Frequency output level -30 dBm (-31 to -29 dBm)	_____
(68.)	1 MHz Center Frequency output level -30 dBm (-31 to -29 dBm)	_____
(68.)	100 MHz Center Frequency output level -30 dBm (-31 to -29 dBm)	_____
(68.)	1 GHz Center Frequency output level -30 dBm (-31 to -29 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -30 dBm (-31 to -29 dBm)	_____
58.	100 kHz Center Frequency output level -40 dBm (-41.5 to -38.5 dBm)	_____
(68.)	1 MHz Center Frequency output level -40 dBm (-41.5 to -38.5 dBm)	_____
(68.)	100 MHz Center Frequency output level -40 dBm (-41.5 to -38.5 dBm)	_____
(68.)	1 GHz Center Frequency output level -40 dBm (-41.5 to -38.5 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -40 dBm (-41.5 to -38.5 dBm)	_____
60.	100 kHz Center Frequency output level -50 dBm (-52 to -48 dBm)	_____
(68.)	1 MHz Center Frequency output level -50 dBm (-52 to -48 dBm)	_____
(68.)	100 MHz Center Frequency output level -50 dBm (-52 to -48 dBm)	_____
(68.)	1 GHz Center Frequency output level -50 dBm (-52 to -48 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -50 dBm (-52 to -48 dBm)	_____
62.	100 kHz Center Frequency output level -60 dBm (-62.5 to -57.5 dBm)	_____
(68.)	1 MHz Center Frequency output level -60 dBm (-62.5 to -57.5 dBm)	_____
(68.)	100 MHz Center Frequency output level -60 dBm (-62.5 to -57.5 dBm)	_____
(68.)	1 GHz Center Frequency output level -60 dBm (-62.5 to -57.5 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -60 dBm (-62.5 to -57.5 dBm)	_____

STEP	DATA	RESULT
64.	100 kHz Center Frequency output level -70 dBm (-73 to -67 dBm)	_____
(68.)	1 MHz Center Frequency output level -70 dBm (-73 to -67 dBm)	_____
(68.)	100 MHz Center Frequency output level -70 dBm (-73 to -67 dBm)	_____
(68.)	1 GHz Center Frequency output level -70 dBm (-73 to -67 dBm)	_____
(68.)	2.9 GHz Center Frequency output level -70 dBm (-73 to -67 dBm)	_____

3-6 CALIBRATION PROCEDURES

3-6-1 POWER SUPPLY VERIFICATION

TEST EQUIPMENT: 1 Digital Multimeter (DMM)

CAUTION: TO AVOID DAMAGE TO TEST EQUIPMENT, DO NOT SWITCH AN900 SERIES SPECTRUM ANALYZER POWER ON UNTIL INSTRUCTED.

STEP	PROCEDURE

1. Refer to Figure 3-4 and use DMM to verify resistance between W41P2-12 (+12 V SWEEP [YIG]) and chassis ground is ≥100 Ω.
2. Refer to Figure 3-4 and use DMM to verify resistance between W41P2-11 (+12 V SWEEP) and chassis ground is ≥100 Ω.
3. Refer to Figure 3-4 and use DMM to verify resistance between W41P2-10 (+12 V [Analog]) and chassis ground is ≥100 Ω.
4. Refer to Figure 3-4 and use DMM to verify resistance between W41P2-9 (-12 V [Analog]) and chassis ground is ≥100 Ω.
5. Refer to Figure 3-4 and use DMM to verify resistance between W41P2-6 (+5 V [Analog]) and chassis ground is ≥5 Ω.
6. Refer to Figure 3-4 and use DMM to verify resistance between W41P2-4 (+35 V) and chassis ground is ≥100 Ω.
7. Refer to Figure 3-4 and use DMM to verify resistance between W41P3-3 (+12 V [Digital]) and chassis ground is ≥100 Ω.
8. Refer to Figure 3-4 and use DMM to verify resistance between W41P3-2 (-12 V [Digital]) and chassis ground is ≥100 Ω.
9. Refer to Figure 3-4 and use DMM to verify resistance between W41P3-6 (+5 V [Digital]) and chassis ground is ≥10 Ω.
10. Refer to Figure 3-4 and use DMM to verify resistance between W41P3-7 (+5 V [Digital]) and chassis ground is ≥10 Ω.
11. Refer to Figure 3-4 and use DMM to verify resistance between W42P2-1 ([+12 V] to CRT) and chassis ground is ≥30 Ω.
12. Refer to Figure 3-4 and use DMM to verify resistance between A8W1P1-1 (+12 V FAN) and chassis ground is ≥30 Ω.
13. Refer to Figure 3-4 and use DMM to verify resistance between A26/A27W1P1-1 ([+12 V] to Medium or High Stability Time Base) and chassis ground is ≥100 Ω.
14. Refer to Figure 3-2 and use DMM to verify resistance between both pins on BAT IN Connector (36) is ≥100 Ω.
15. Press POWER Switch (17) On. Verify POWER ON Indicator (15) illuminates.

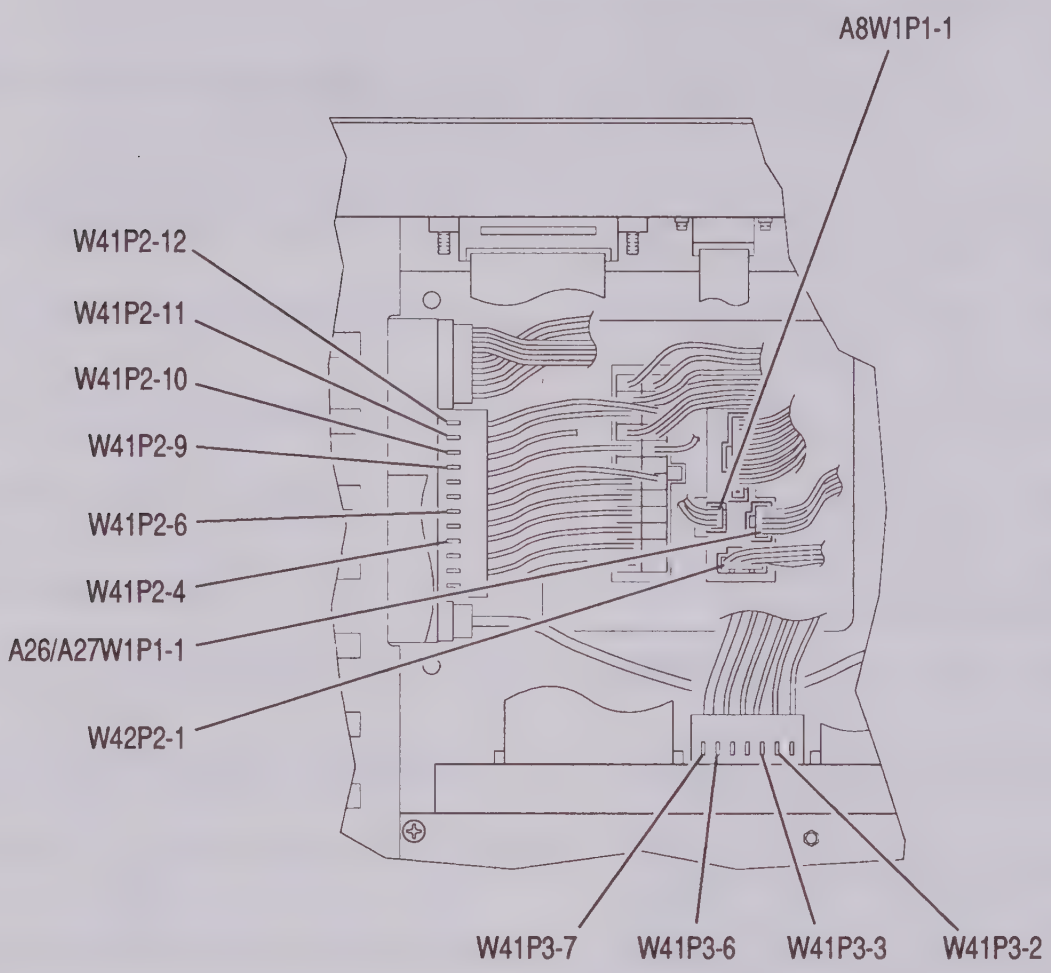


Figure 3-4 Power Supply Test Points

16. Refer to Figure 3-4 and use DMM to verify voltage between W41P2-12 (+12 V SWEEP [YIG]) and chassis ground is +12 Vdc (±0.25 V).

17. Refer to Figure 3-4 and use DMM to verify voltage between W41P2-11 (+12 V SWEEP) and chassis ground is +12 Vdc (±0.25 V).

18. Refer to Figure 3-4 and use DMM to verify voltage between W41P2-10 (+12 V [Analog]) and chassis ground is +12 Vdc (±0.25 V).

19. Refer to Figure 3-4 and use DMM to verify voltage between W41P2-9 (-12 V [Analog]) and chassis ground is -12 Vdc (±0.25 V).

20. Refer to Figure 3-4 and use DMM to verify voltage between W41P2-6 (+5 V [Analog]) and chassis ground is +5 Vdc (±0.1 V).

STEP	PROCEDURE

21. Refer to Figure 3-4 and use DMM to verify voltage between W41P2-4 (+35 V) and chassis ground is +35 Vdc (±1.0 V).

22. Refer to Figure 3-4 and use DMM to verify voltage between W41P3-3 (+12 V [Digital]) and chassis ground is +12 Vdc (±0.25 V).

23. Refer to Figure 3-4 and use DMM to verify voltage between W41P3-2 (-12 V [Digital]) and chassis ground is -12 Vdc (±0.25 V).

24. Refer to Figure 3-4 and use DMM to verify voltage between W41P3-6 (+5 V [Digital]) and chassis ground is +5 Vdc (+0.25 V/-0.15 V).

25. Refer to Figure 3-4 and use DMM to verify voltage between W41P3-7 (+5 V [Digital]) and chassis ground is +5 Vdc (+0.25 V/-0.15 V).

26. Refer to Figure 3-4 and use DMM to verify voltage between W42P2-1 ([+12 V] to CRT) and chassis ground is +12 Vdc (±0.25 V).

27. Refer to Figure 3-4 and use DMM to verify voltage between A8W1P1-1 (+12 V FAN) and chassis ground is +12 Vdc (±0.25 V).

28. Refer to Figure 3-4 and use DMM to verify voltage between A26/A27W1P1-1 ([+12 V] to Medium or High Stability Time Base) and chassis ground is +12 Vdc (±0.25 V).

29. Refer to Figure 3-2 and use DMM to verify voltage between both pins on BAT IN Connector (36) is +13.8 Vdc (±0.2 V).

30. Remove power and disconnect equipment.

3-6-2 SYSTEM CALIBRATION

TEST EQUIPMENT:
- 1 Diode Switch
- 1 External 10 MHz Reference
- 1 Frequency Counter
- 1 Function Generator
- 1 Microwave Signal Generator
- 1 Oscilloscope
- 1 Power Meter
- 1 Signal Generator
- 1 Spectrum Analyzer
- 1 Tracking Generator Test Cable (for Option 02)

STEP PROCEDURE

1. Apply power to AN900 Series Spectrum Analyzer.
2. Press POWER Switch (17) On. Allow 15 minutes stabilization period.
3. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) for initial settings.
4. Connect External 10 MHz Reference to EXT REF IN Connector (33).
5. Press CONFIG MEMORY Key (23), 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Options Menu.
6. Use DATA SCROLL ↑ and ↓ Keys (4), DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to set Options Menu according to Figure 3-5. (AN930 does not have FM COUPLING.)

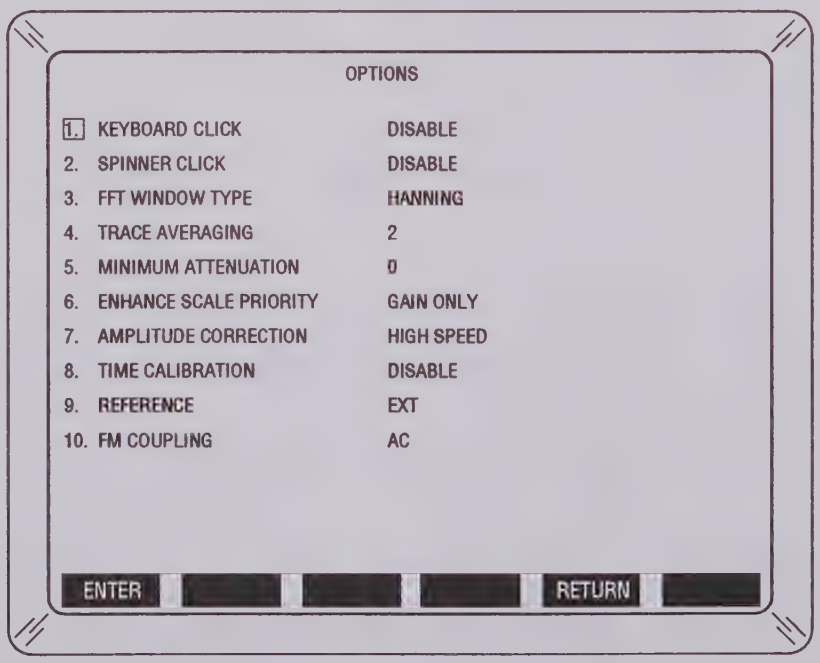
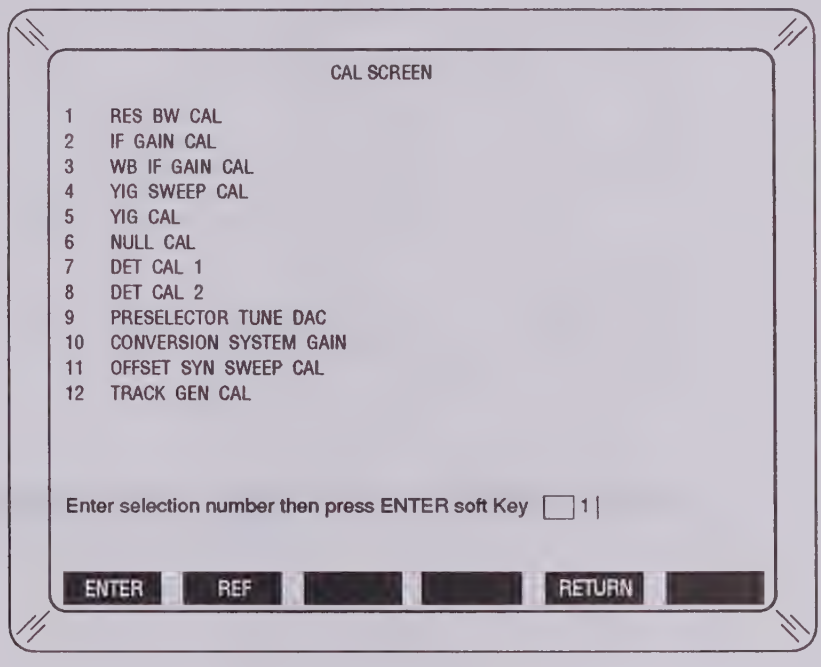


Figure 3-5 Options Menu Settings

7. Press RETURN Soft Function Key F5 (14) to return to Analyzer Configuration Screen.

8. Press RAW CAL Soft Function Key F2. Use DATA ENTRY Keypad (22) to enter password (***111846*** for AN930 or AN930A, ***020546*** for AN920, ***040166*** for AN940). Press RAW CAL Soft Function Key F2 to enter Cal Screen. (Entering Cal Screen according to Step 8 eliminates repeated password entries to display other calibration screens. If password prompt appears anytime during Calibration, refer to Step 8.)

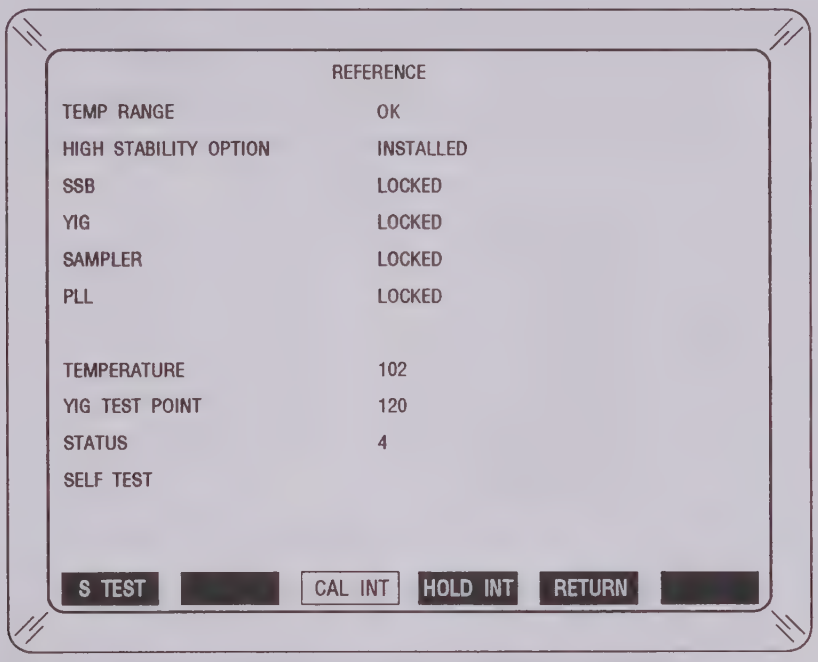


7210025

Figure 3-6 Cal Screen

REFERENCE LOCK VERIFICATION

9. Press REF Soft Function Key F2 (14) to enter Reference Screen. Verify PLL is ***LOCKED*** to External 10 MHz Reference.



7210026

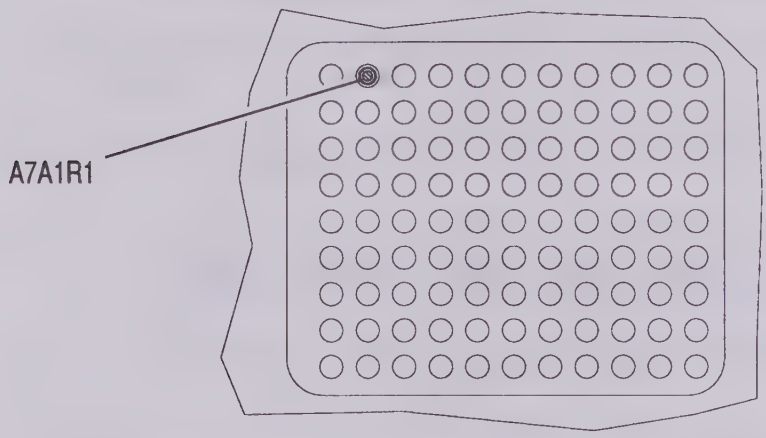
Figure 3-7 Reference Screen

CRT BRIGHTNESS

10. Press CENTER FREQUENCY Key (20).

11. Turn INTENSITY Control (1) fully clockwise.

12. Verify raster is not visible. If raster is visible, refer to Figure 3-8 and adjust MASTER BRIGHTNESS A7A1R1 on left side (from front) of CRT Assembly until raster is not visible.



PREFIX ALL REFERENCE DESIGNATORS WITH 72A1 (AN930)
02A1 (AN920), 03A1 (AN930A) OR 04A1 (AN940).

7218026

Figure 3-8 MASTER BRIGHTNESS Adjustment

MANUAL CALIBRATIONS ONE THROUGH FIVE

13. Press CONFIG MEMORY Key (23) and MAN CAL Soft Function Key F4 (14) to enter Manual Cal Screen.

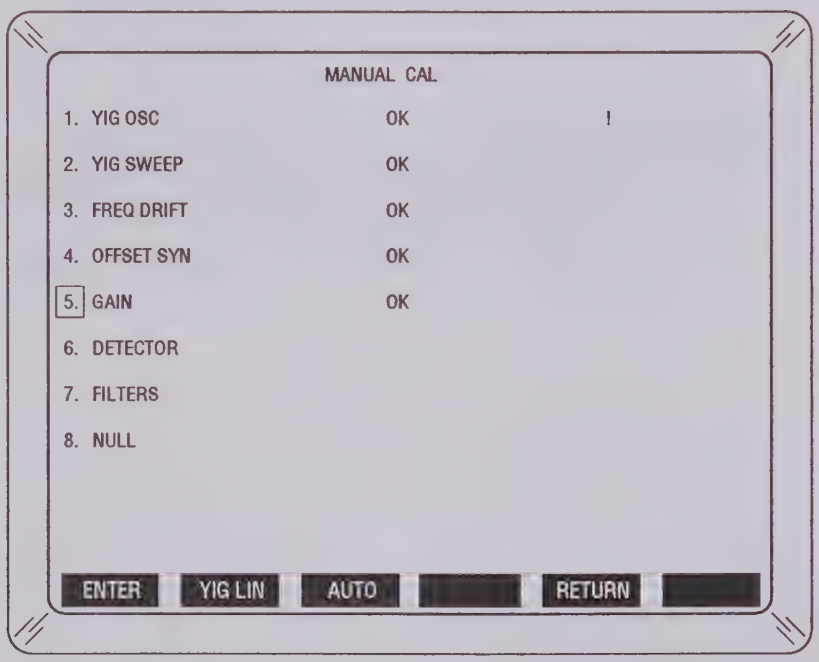
14. Press 1 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to activate YIG Oscillator calibration.

15. After unit finishes YIG Oscillator calibration, press 2 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to activate YIG Sweep calibration.

16. After unit finishes YIG Sweep calibration, press 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to activate Frequency Drift calibration.

17. After unit finishes Frequency Drift calibration, press 4 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to activate Offset Synthesizer calibration.

18. After unit finishes Offset Synthesizer calibration, press 5 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to activate IF Gain calibration.

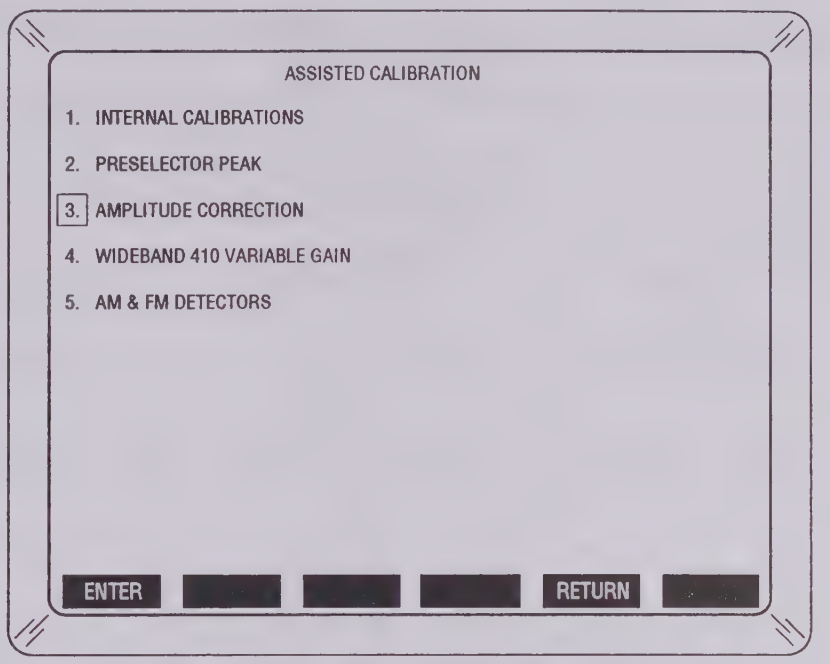


7210012

Figure 3-9 Manual Cal Screen (1-5)

AMPLITUDE CORRECTION INITIAL SETTINGS

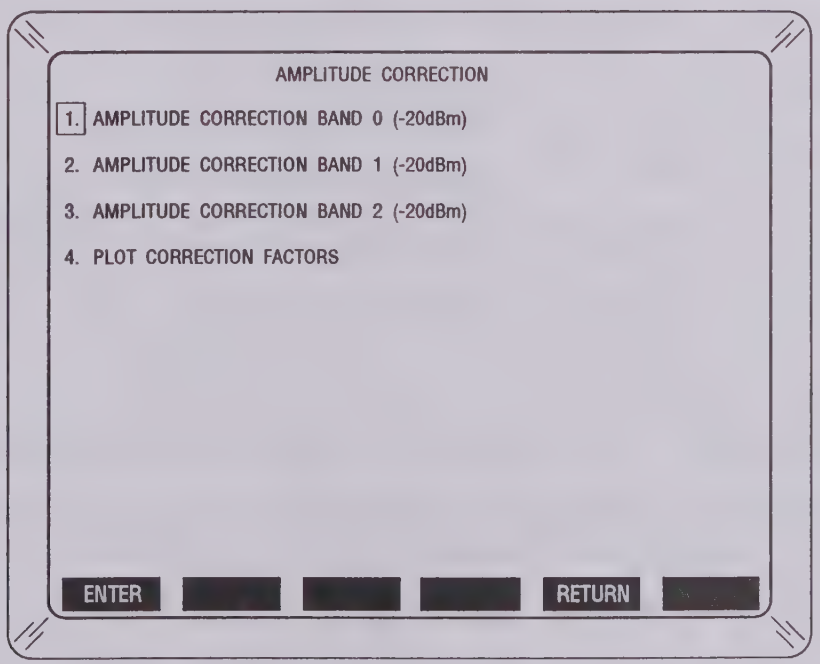
19. After unit finishes IF Gain calibration, press RETURN Soft Function Key F5 (14) and ASTD CAL Soft Function Key F5 (14) to enter Assisted Calibration Screen. (AN920 does not have 2. PRESELECTOR PEAK.)



7210013

Figure 3-10 Assisted Calibration Screen

20. Press 2 (AN920) or 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Screen.



7210027

Figure 3-11 Amplitude Correction Screen

21. Press 1 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Band 0 (-20 dBm) Screen.

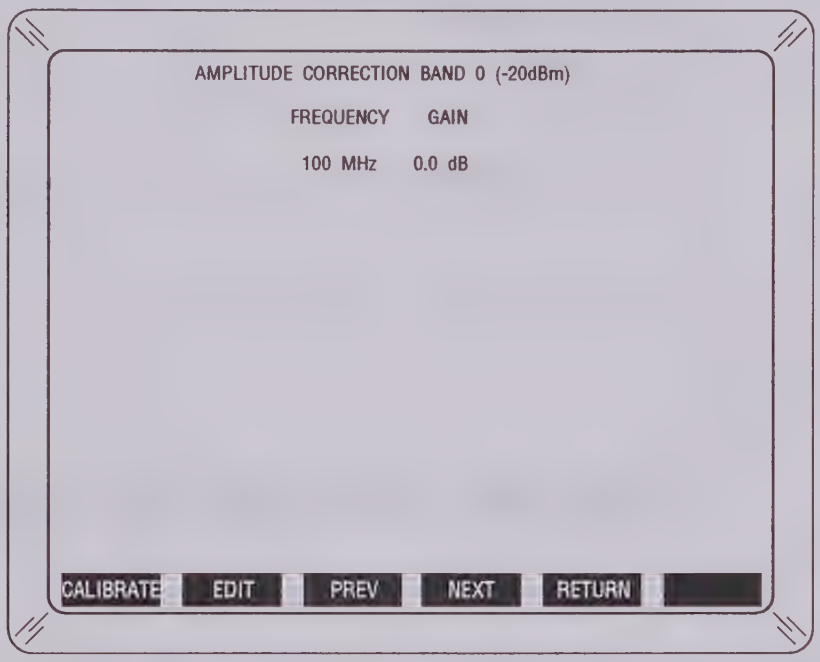


Figure 3-12 Amplitude Correction Band 0 (-20 dBm) Screen

22. Press NEXT Soft Function Key F4 (14), EDIT Soft Function Key F2 (14) and 0 on DATA ENTRY Keypad (22) to set 100 MHz Amplitude Correction Gain to ***0 dB***.

23. Press RETURN Soft Function Key F5 (14) to return to Amplitude Correction Screen.

NOTE: Steps 24 through 27 do not apply to AN920.

24. Press 2 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Band 1 (-20 dBm) Screen.

25. Turn DATA SCROLL Spinner (11) until FREQUENCY field displays ***7.0 GHz***. Press EDIT Soft Function Key F2 (14) and 0 on DATA ENTRY Keypad (22) to set 7.0 GHz Amplitude Correction Gain to ***0 dB***.

26. Press RETURN Soft Function Key F5 (14), 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Band 2 (-20 dBm) Screen.

27. Turn DATA SCROLL Spinner (11) until FREQUENCY field displays ***15.0 GHz***. Press EDIT Soft Function Key F2 (14) and 0 on DATA ENTRY Keypad (22) to set 15.0 GHz Amplitude Correction Gain to ***0 dB***.

CONVERSION SYSTEM GAIN (100 MHz)

28. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***100 MHz***.

29. Press SPAN FREQUENCY Key (20) and ZERO Soft Function Key F1 (14) in succession to set Frequency Span to ***0 Hz/DIV*** or ***ZERO*** (AN930).

30. Press ATTEN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal attenuation to ***0 dB***.

31. Press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set gain to ***0.0 dB***.

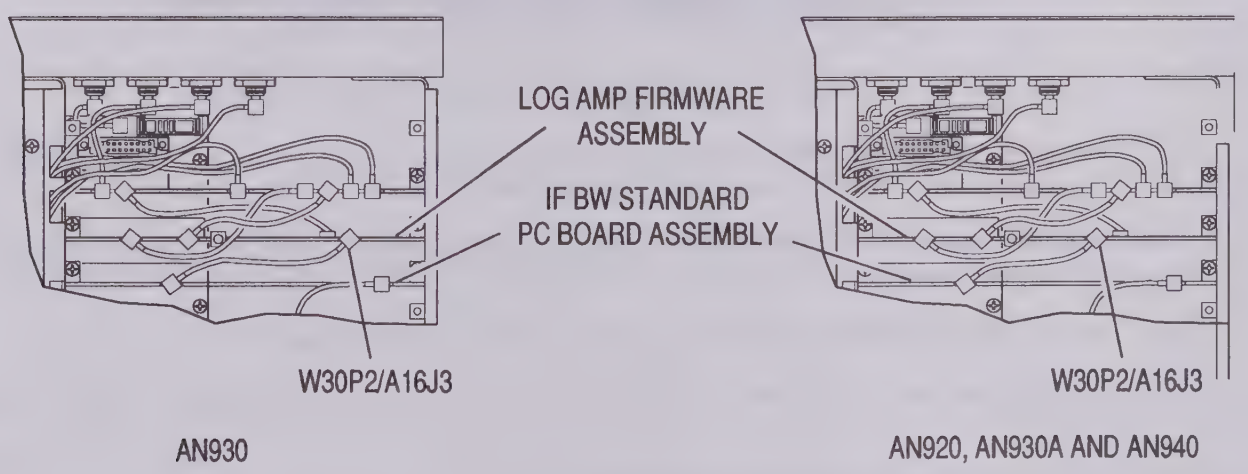
32. Press SCALE AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set Amplitude Scale per division to ***10 dB***.

33. Press BW AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set BW field to ***30 kHz***.

34. Connect Signal Generator to ANALYZER INPUT Connnector (7).

35. Set Signal Generator for 100 MHz at -30 dBm output. Verify CRT (18) displays signal.

36. Refer to Figure 3-13 and disconnect W30P2 from A16J3 on Log Amp Firmware Assembly.



PREFIX ALL REFERENCE DESIGNATORS WITH 72A1 (AN930) 02A1 (AN920), 03A1 (AN930A) OR 04A1 (AN940).

7218025

Figure 3-13 10.7 MHz Signal Cable (W30)

37. Connect W30P2 from IF Bandwidth Standard PC Board Assembly to external Spectrum Analyzer referenced to 10.7 MHz at -3 dBm.

38. Verify signal level is -3 dBm (±1.0 dB) on external Spectrum Analyzer. If not, adjust Band 0 conversion system gain as follows:

    - Press CONFIG MEMORY Key (23), RAW CAL Soft Function Key F2 (14), 9 (AN920) or 10 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Conversion System Gain Screen.

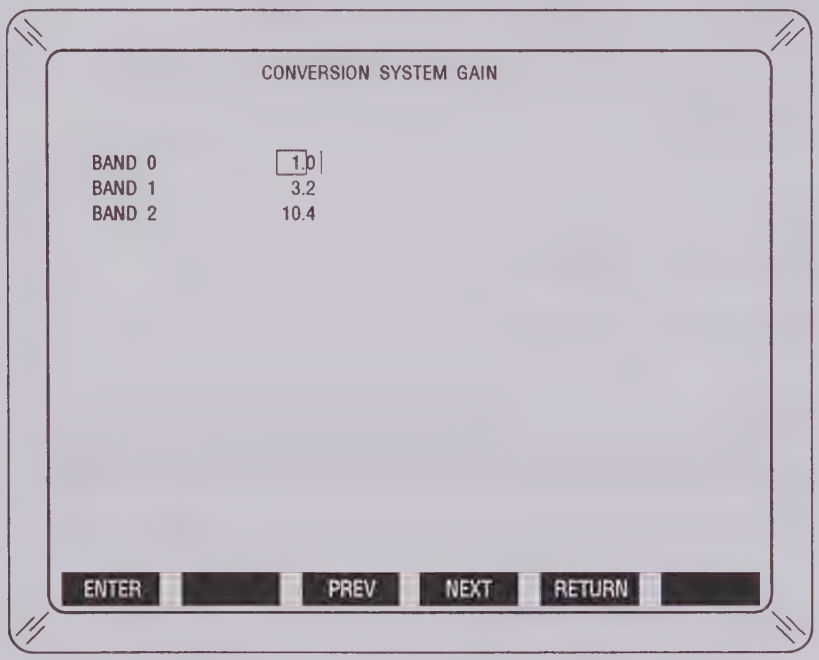


Figure 3-14 Conversion System Gain Screen

    - Use NEXT Soft Function Key F4 (14) or PREV Soft Function Key F3 (14), if needed, to move cursor to Band 0 Conversion System Gain field.
    - Use DATA SCROLL ↑ and ↓ Keys (4) to increase or decrease DAC value for Band 0 Conversion System Gain.
    - Press CENTER FREQUENCY Key (20) to resume normal operation.
    - Verify signal level is -3 dBm (±1.0 dB) on external Spectrum Analyzer. If not, repeat Step 38.

39. Disconnect Spectrum Analyzer from W30P2.

40. Reconnect W30P2 to A16J3 on Log Amp Firmware Assembly.

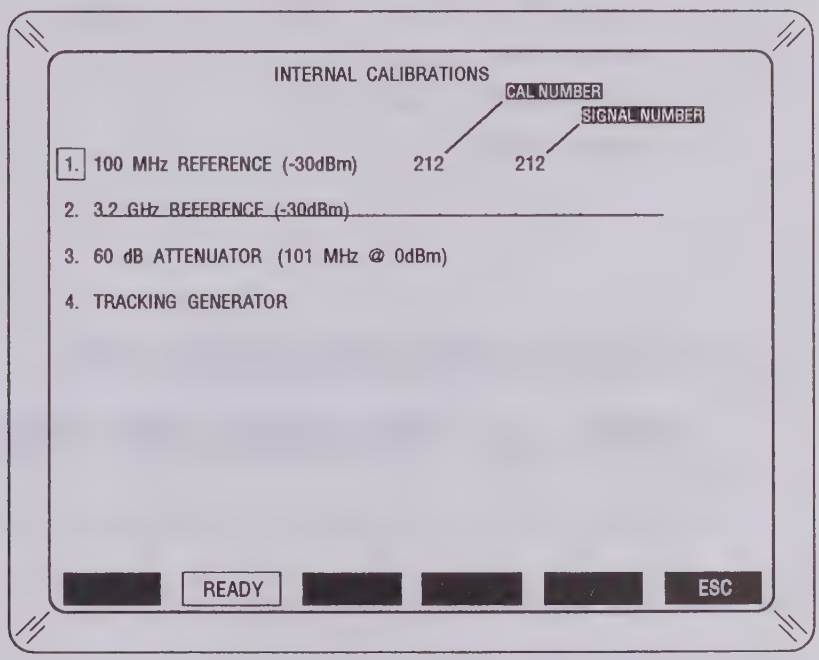
INTERNAL CALIBRATIONS

41. Press CONFIG MEMORY Key (23) and ASTD CAL Soft Function Key F5 (14) to enter Assisted Calibration Screen.

42. Press 1 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Internal Calibrations Screen.

43. Press 1 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to set 100 MHz Reference level.

44. Adjust Signal Generator level until Signal Number equals Cal Number.



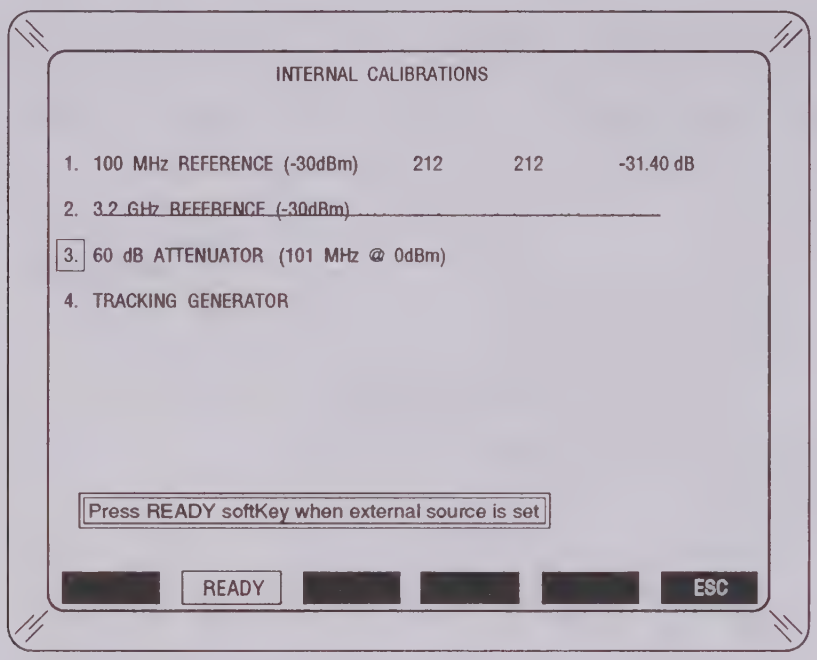
7210032

Figure 3-15 Internal Calibrations Screen (100 MHz Ref)

45. Press READY Soft Function Key F2 (14).

46. Use DATA ENTRY Keypad (22) to enter dBm level of Signal Generator (verified by Power Meter) and press ENTER Soft Function Key F1 (14).

47. Press 2 (AN920) or 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to set 60 dB Attenuator level.



7210033

Figure 3-16 Internal Calibrations Screen (60 dB Atten)

48. Set Signal Generator for 101 MHz at 0 dBm output.

49. Press READY Soft Function Key F2 (14).

50. Adjust Signal Generator level (≈-60 dBm) until Signal Number equals Cal Number.

51. Press READY Soft Function Key F2 (14).

52. Use DATA ENTRY Keypad (22) to enter dBm level of Signal Generator (verified by Power Meter) and press ENTER Soft Function Key F1 (14).

53. Disconnect Signal Generator from ANALYZER INPUT Connector (7).

MANUAL CALIBRATIONS SIX THROUGH EIGHT

54. Press RETURN Soft Function Key F5 (14) twice and MAN CAL Soft Function Key F4 (14) to enter Manual Cal Screen.

55. Press 6 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to activate Detector calibration.

56. After unit finishes Detector calibration, press 7 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to activate Filters calibration.

57. After unit finishes Filters calibration, press 8 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to activate Null calibration.

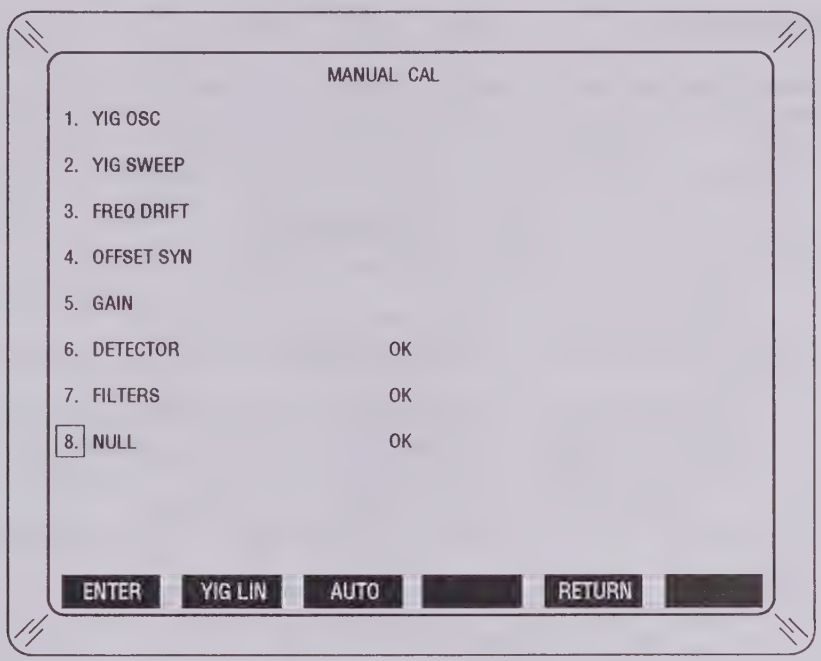


Figure 3-17 Manual Cal Screen (6-8)

WIDEBAND 410 VARIABLE GAIN

58. After unit finishes Null calibration, press RETURN Soft Function Key F5 (14) and ASTD CAL Soft Function Key F5 (14) to enter Assisted Calibration Screen.

59. Press 3 (AN920) or 4 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Wideband 410 Variable Gain Screen.

60. Connect Signal Generator to ANALYZER INPUT Connector (7).

61. Follow instructions in Wideband 410 Variable Gain Screen, setting Signal Generator accordingly (levels verified by Power Meter), until all Wideband 410 Variable Gain signal levels are calibrated and entered.

AM/FM DETECTORS

62. Press 4 (AN920) or 5 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter AM & FM Detectors Screen.

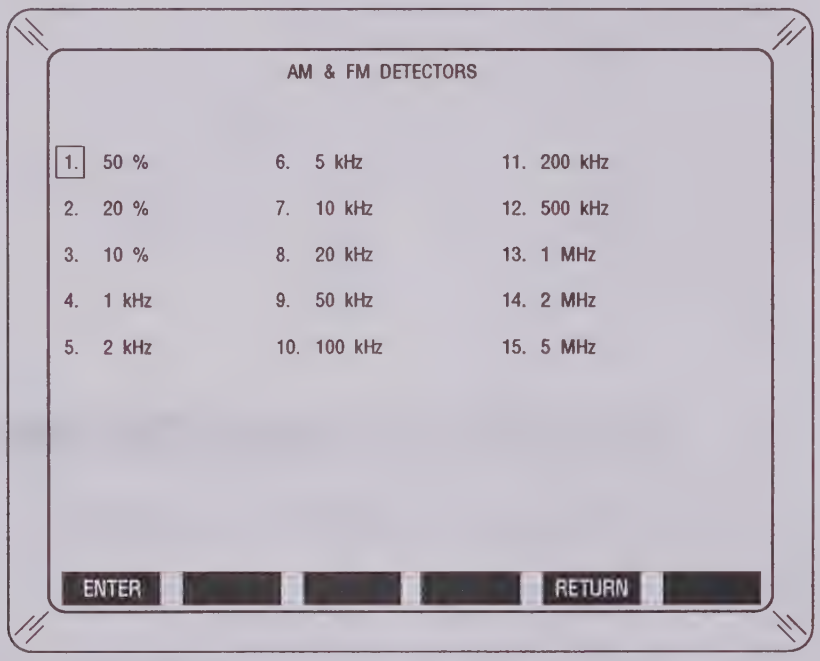


Figure 3-18 AM & FM Detectors Screen

63. Use DATA SCROLL ↑ and ↓ Keys (4) and press ENTER Soft Function Key F1 (14) to select each modulation setting.

64. Follow instructions in AM & FM Detectors Screen, setting Signal Generator with modulation accordingly, until all AM and FM modulation settings are calibrated and entered.

65. Press AUX MODE Key (19), RCVR* Soft Function Key F1 (14) and USER Soft Function Key F5 (14) in succession to activate AM/FM Receiver mode.

66. Set Signal Generator to 500 MHz at -30 dBm with 5 MHz FM modulation.

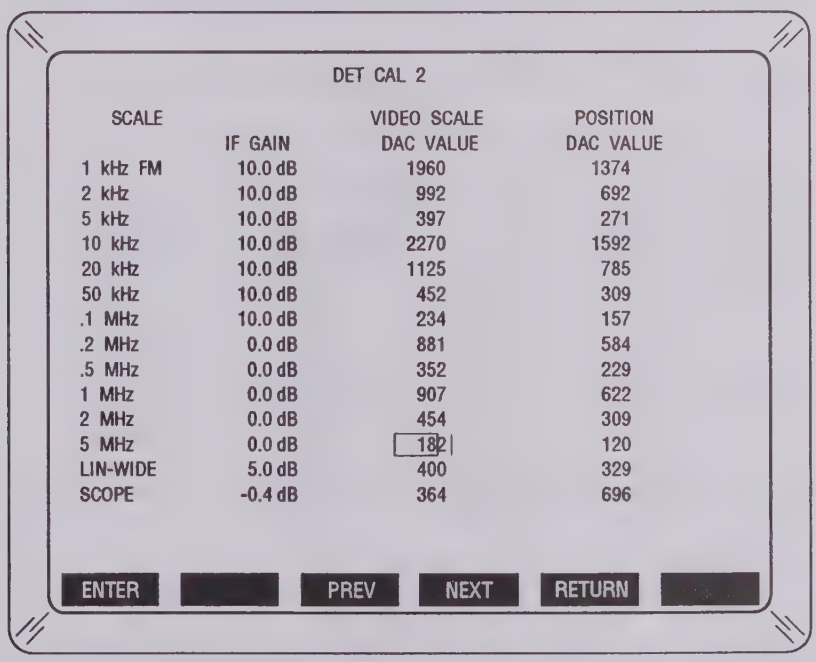
67. Press SCALE AMPLITUDE Key to enter Scale Amplitude Operation Screen.

68. Use DATA SCROLL ↑ and ↓ Keys to set SCALE field to ***5 MHz***.

69. Verify CRT displays correct deviation. If not, adjust VIDEO SCALE and POSITION DAC VALUES as follows:

- Press CONFIG MEMORY Key (23), RAW CAL Soft Function Key F2 (14), 8 on DATA ENTRY Keypad (22) for Det Cal 2 Screen (or 7 on DATA ENTRY Keypad [22] for Det Cal 1 Screen) and ENTER Soft Function Key F1 (14) to enter applicable Det Cal Screen.
- Use NEXT Soft Function Key F4 (14) and PREV Soft Function Key F3 (14) to move cursor to desired DAC value.
- Use DATA SCROLL ↑ and ↓ Keys (4) to increase or decrease DAC values, as needed.

  Adjust VIDEO SCALE DAC VALUE to increase or decrease amplitude. Adjust POSITION DAC value to keep waveform centered vertically within graticule scale. (The DACs are interactive and may require several adjustments.)
- Press CONFIG MEMORY Key (23) twice to return to normal operation.
- Verify corrections. Repeat Step 69 to readjust DAC values, as needed.



7210030

Figure 3-19 Det Cal 2 Screen

70. Repeat Steps 66 through 69, setting input modulation and SCALE field settings according to Table 3-2.

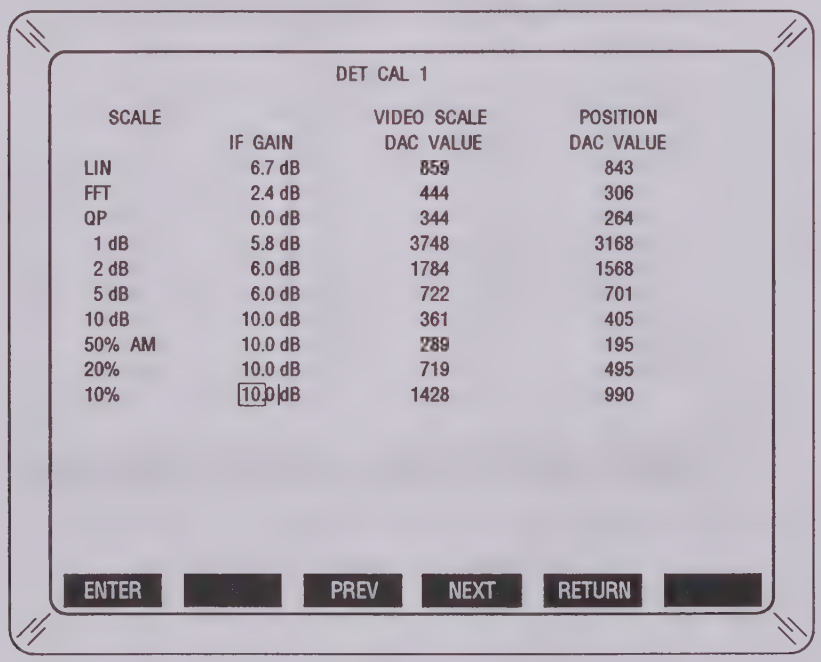
MODULATION	SCALE	DAC SCREEN	MODULATION	SCALE	DAC SCREEN
4 MHz FM	2 MHz	Det Cal 2	30 kHz FM	10 kHz	Det Cal 2
3 MHz FM	1 MHz	Det Cal 2	15 kHz FM	5 kHz	Det Cal 2
1.5 MHz FM	500 kHz	Det Cal 2	6 kHz FM	2 kHz	Det Cal 2
600 kHz FM	200 kHz	Det Cal 2	3 kHz FM	1 kHz	Det Cal 2
300 kHz FM	100 kHz	Det Cal 2	30% AM	10%	Det Cal 1
150 kHz FM	50 kHz	Det Cal 2	60% AM	20%	Det Cal 1
60 kHz FM	20 kHz	Det Cal 2	50% AM	50%	Det Cal 1

Table 3-2 AM/FM Detectors Input Modulation and SCALE Field Settings

NOTE: For FM scales ≤100 kHz and all AM scales, RBW is 5 MHz. If not, set to 5 MHz.

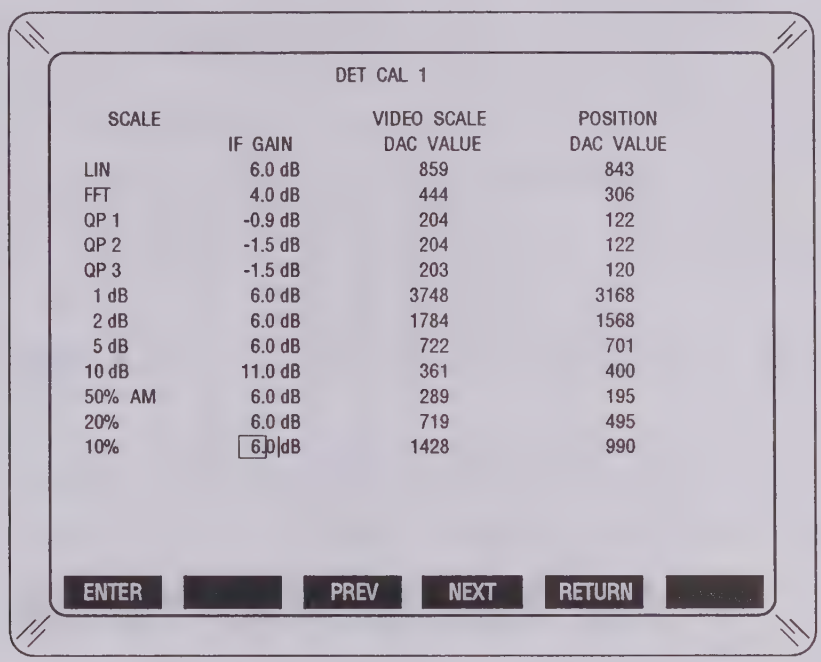
71. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

72. Disconnect Signal Generator from ANALYZER INPUT Connector (7).



7210029

Figure 3-20 Det Cal 1 Screen for AN930



0210020

Figure 3-21 Det Cal 1 Screen for AN920, AN930A and AN940

SCOPE AMPLITUDE

73. Press AUX MODE Key (19), EXT IN* Soft Function Key F4 (14) and DC Soft Function Key F2 (14) in succession. If necessary, press FFT Soft Function Key F4 (14) to activate Scope mode (SCOPE label above Soft Function Key F4 [14] highlighted).

74. Press V POS Soft Function Key F5 (14) and use DATA SCROLL ↑ and ↓ Keys (4) to set Amplitude Scale Offeset to ***2 DIV***.

75. Press SCALE AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set Amplitude Scale per division to ***100 mV***.

76. Press SWEEP MODE Key (19) and use DATA ENTRY Keypad (22) to set Sweep Time per division to ***500 μs***.

77. Connect Oscilloscope Probe Adjust Output to EXTERNAL INPUT Connector (10).

78. Press TRIG* Soft Function Key F4 (14) and TRIG LVL Soft Function Key F1 (14). Use DATA SCROLL Spinner (11) to adjust sweep Trigger Level for steady signal on CRT (18).

79. Refer to Figure 3-22 and verify 1 kHz square wave on CRT (18).

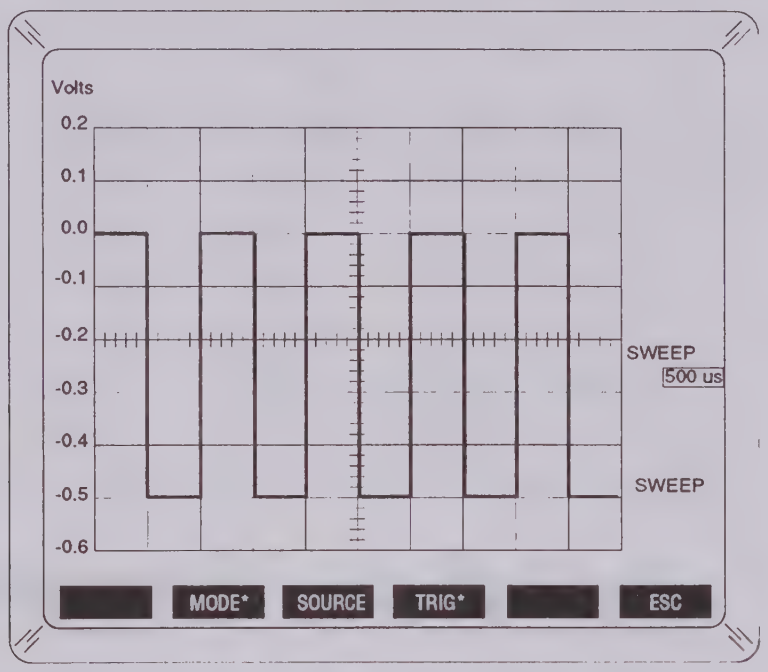


Figure 3-22 Scope Amplitude 1 kHz Square Wave

80. Press MARKER MODE Key (19) and use DATA SCROLL Spinner (11) to move Marker 1 to positive peak.

81. Press MKR 2 Soft Function Key F2 (14) and use DATA SCROLL Spinner (11) to move Marker 2 to negative peak.

82. Press DELTA Soft Function Key F3 (14) to activate Delta function.

83. Verify Delta field level is within ±24 mV of probe adjust output level specified by Oscilloscope. If not, adjust SCOPE VIDEO SCALE DAC VALUE as follows:

    - Press CONFIG MEMORY Key (23), RAW CAL Soft Function Key F2 (14), 8 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Det Cal 2 Screen.
    - Use NEXT Soft Function Key F4 (14) or PREV Soft Function Key F3 (14) to move cursor to SCOPE VIDEO SCALE DAC VALUE field.
    - Use DATA SCROLL ↑ and ↓ Keys (4) to increase or decrease DAC value, as needed.
    - Press CONFIG MEMORY Key (23) twice to return to normal operation.
    - Verify correction. Repeat Step 83 to readjust SCOPE VIDEO SCALE DAC VALUE, as needed.

84. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

85. Disconnect test equipment.

QUASI-PEAK DETECTOR (OPTION 08)

86. If necessary, press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***100 MHz***.

87. Press SPAN FREQUENCY Key (20) and ZERO Soft Function Key F1 (14) in succession to set Frequency Span to ***0 Hz/DIV*** or ***ZERO*** (AN930).

88. Press ATTEN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal attenuation to ***10 dB***.

89. Press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal gain to ***24.0 dB***.

90. Press BW AMPLITUDE Key (21) and QPEAK Soft Function Key F4 (14) to activate Quasi-Peak Detector. Use DATA ENTRY Keypad (22) to set BW field to ***120 kHz***.

91. Press SCALE AMPLITUDE Key (21), UNITS* Soft Function Key F5 (14), dB Soft Function Key F5 (14) and uV Soft Function Key F4 (14) to set units to dBµV.

92. Connect Signal Generator to ANALYZER INPUT Connnector (7).

93. Set Signal Generator for 100 MHz CW at -47 dBm.

94. Press MARKER MODE Key (19) and DATA SCROLL Spinner (11) to activate and move Marker 1 onto CRT (18) display, if needed.

95. Verify Marker 1 amplitude is 60 dB (±1 dB) indicating signal level is 60 dBµV (±1 dB). If within tolerance, record signal level as reference. If not, adjust QP IF GAIN field as follows:

    - Press CONFIG MEMORY Key (23), RAW CAL Soft Function Key F2 (14), 7 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Det Cal 1 Screen.
    - Use NEXT Soft Function Key F4 (14) or PREV Soft Function Key F3 (14) to move cursor to QP IF GAIN field (AN930) or QP3 IF GAIN field.
    - Use DATA SCROLL ↑ and ↓ Keys (4) to increase or decrease IF gain as needed.
    - Press CONFIG MEMORY Key (23) twice to resume prior operation.
    - Verify Marker 1 amplitude is 60 dB (±1 dB). If within tolerance, record signal level as reference. If not, repeat Step 95.

96. Press BW AMPLITUDE Key (21) and DATA SCROLL ↓ Key (4) to set BW field to ***9 kHz***.

97. Verify Marker 1 amplitude is 60 dB (±1 dB) indicating signal level is 60 dBµV (±1 dB). If within tolerance, record signal level as reference. If not, adjust QP IF GAIN field as follows:

    - Press CONFIG MEMORY Key (23), RAW CAL Soft Function Key F2 (14), 7 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Det Cal 1 Screen.
    - Use NEXT Soft Function Key F4 (14) or PREV Soft Function Key F3 (14) to move cursor to QP IF GAIN field (AN930) or QP2 IF GAIN field.
    - Use DATA SCROLL ↑ and ↓ Keys (4) to increase or decrease IF gain as needed.
    - Press CONFIG MEMORY Key (23) twice to resume prior operation.
    - Verify Marker 1 amplitude is 60 dB (±1 dB). If within tolerance, record signal level as reference. If not, repeat Step 97.

98. Press BW AMPLITUDE Key (21) and DATA SCROLL ↓ Key (4) to set BW field to ***200 Hz***.

99. Verify Marker 1 amplitude is 60 dB (±1 dB) indicating signal level is 60 dBµV (±1 dB). If within tolerance, record signal level as reference. If not, adjust QP IF GAIN field as follows:

    - Adjust Signal Generator frequency for peak amplitude level.
    - Press CONFIG MEMORY Key (23), RAW CAL Soft Function Key F2 (14), 7 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Det Cal 1 Screen.
    - Use NEXT Soft Function Key F4 (14) or PREV Soft Function Key F3 (14) to move cursor to QP IF GAIN field (AN930) or QP1 IF GAIN field.
    - Use DATA SCROLL ↑ and ↓ Keys (4) to increase or decrease IF gain as needed.
    - Press CONFIG MEMORY Key (23) twice to resume prior operation.
    - Verify Marker 1 amplitude is 60 dB (±1 dB). If within tolerance, record signal level as reference. If not, repeat Step 99.

    NOTE: (For AN930) If QP IF GAIN field is adjusted in any step, repeat Steps 90 and 95 through 99 until no adjustments are required.

100. Connect test equipment according to Figure 3-23 with Power Meter connected to Diode Switch.

101. Set Function Generator for 1 µs wide pulse at 100 Hz PRF. Set high amplitude to 2.5 V and low amplitude to 2.4 V to keep Diode Switch activated.

102. Set Signal Generator for 100 MHz CW. Adjust Signal Generator level for -17.1 dBm on Power Meter. Record Signal Generator level.

103. Adjust Signal Generator level for -14.0 dBm on Power Meter. Record Signal Generator level.

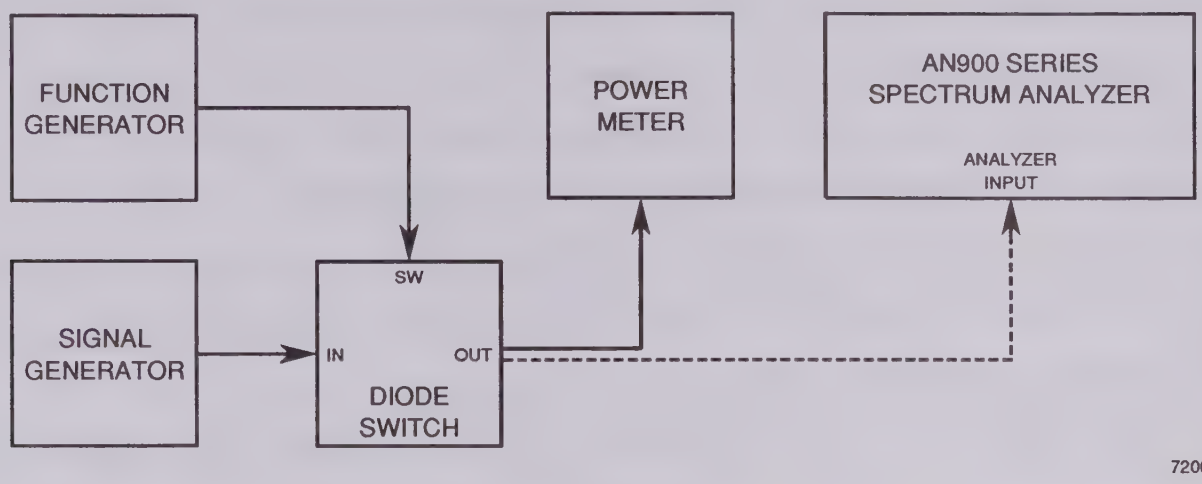


Figure 3-23 Quasi-Peak Verification Test Setup Diagram

104. Adjust Signal Generator level for -13.4 dBm on Power Meter. Record Signal Generator level.

105. Set Function Generator high amplitude to 2.5 V and low amplitude to -0.5 V to pulse activate and deactivate Diode Switch.

106. Adjust Signal Generator to level referenced in Step 102 (-17.1 dBm Diode Switch output).

107. Disconnect Power Meter from Diode Switch. Connect Diode Switch to ANALYZER INPUT Connector (7) according to Figure 3-23.

108. Press BW AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set BW field to ***120 kHz***.

109. Verify Marker 1 amplitude is at Step 95 reference level (±1 dB). Record level.

110. Set Function Generator PRF to 1 kHz.

111. Press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal gain to ***18.0 dB***.

112. Verify Marker 1 amplitude is between 6.5 and 9.5 dB above Step 109 level. Record level.

113. Set Function Generator PRF to 20 Hz.

114. Use DATA ENTRY Keypad (22) to set gain to ***25.0 dB***.

115. Verify Marker 1 amplitude is between 7.5 and 10.5 dB below Step 109 level. Record level.

116. Set Function Generator PRF to 10 Hz.

117. Verify Marker 1 amplitude is between 12.5 and 15.5 dB below Step 109 level. Record level.

118. Set Function Generator PRF to 5 Hz.

STEP	PROCEDURE

119. Verify Marker 1 amplitude is between 18 and 22 dB below Step 109 level. Record level.

120. Adjust Signal Generator to level referenced in Step 103 (-14.0 dBm Diode Switch output).

121. Set Function Generator for 5 µs wide pulse at 100 Hz PRF.

122. Use DATA ENTRY Keypad (22) to set internal gain to ***24.0 dB***.

123. Press BW AMPLITUDE Key (21) and DATA SCROLL ↓ Key (4) to set BW field to ***9 kHz***.

124. Verify Marker 1 amplitude is at Step 97 reference level (±1 dB). Record level.

125. Set Function Generator PRF to 1 kHz.

126. Press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal gain to ***19.0 dB***.

127. Verify Marker 1 amplitude is between 3.5 and 5.5 dB above Step 124 level. Record level.

128. Set Function Generator PRF to 20 Hz.

129. Use DATA ENTRY Keypad (22) to set gain to ***30.0 dB***.

130. Verify Marker 1 amplitude is between 5.5 and 7.5 dB below Step 124 level. Record level.

131. Set Function Generator PRF to 10 Hz.

132. Verify Marker 1 amplitude is between 8.5 and 11.5 dB below Step 124 level. Record level.

133. Set Function Generator PRF to 2 Hz.

134. Press DSPL MEMORY Key (23) and PK HOLD Soft Function F2 (14) to activate Peak Hold function.

135. Press STORE MEMORY Key (23) and use DATA ENTRY Keypad (22) to select available Memory Location.

136. Press RECALL MEMORY Key (23) and use DATA ENTRY Keypad (22) to select Memory Location selected in Step 135.

137. Press MARKER MODE Key (19) to activate Marker 1.

138. Use DATA SCROLL Spinner (11) to move Marker 1 to highest amplitude level. Verify Marker 1 amplitude is between 18.5 and 22.5 dB below Step 124 level. Record level.

139. Press RECALL MEMORY Key (23) and REMOVE Soft Function Key F2 (14). Use DATA ENTRY Keypad (22) to select Memory Location selected in Step 136.

140. Adjust Signal Generator to level referenced in Step 104 (-13.4 dBm Diode Switch output).

141. Set Function Generator for 200 µs wide pulse at 25 Hz PRF.

142. Use DATA ENTRY Keypad (22) to set internal gain to ***24.0 dB***.

STEP	PROCEDURE

143. Press BW AMPLITUDE Key (21) and DATA SCROLL ↓ Key (4) to set BW field to ***200 Hz***.

144. Verify Marker 1 amplitude is at Step 103 reference level (±1 dB). Record level.

145. Set Function Generator PRF to 60 Hz.

146. Press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal gain to ***20.0 dB***.

147. Verify Marker 1 amplitude is between 2 and 4 dB above Step 144 level. Record level.

148. Set Function Generator PRF to 100 Hz.

149. Verify Marker 1 amplitude is between 3 and 5 dB above Step 144 level. Record level.

150. Set Function Generator PRF to 10 Hz.

151. Use DATA ENTRY Keypad (22) to set gain to ***30.0 dB***.

152. Verify Marker 1 amplitude is between 3 and 5 dB below Step 144 level. Record level.

153. Set Function Generator PRF to 5 Hz.

154. Verify Marker 1 amplitude is between 6 and 9 dB below Step 144 level. Record level.

155. Set Function Generator PRF to 2 Hz.

156. Press DSPL MEMORY Key (23) and PK HOLD Soft Function F2 (14) to activate Peak Hold function.

157. Press STORE MEMORY Key (23) and use DATA ENTRY Keypad (22) to select available Memory Location.

158. Press RECALL MEMORY Key (23) and use DATA ENTRY Keypad (22) to select Memory Location selected in Step 157.

159. Press MARKER MODE Key (19) to activate Marker 1.

160. Use DATA SCROLL Spinner (11) to move Marker 1 to highest amplitude level. Verify Marker 1 amplitude is between 11 and 15 dB below Step 144 level. Record level.

161. Press RECALL MEMORY Key (23) and REMOVE Soft Function Key F2 (14). Use DATA ENTRY Keypad (22) to select Memory Location selected in Step 158.

162. Set Function Generator PRF to 1 Hz.

163. Press DSPL MEMORY Key (23) and PK HOLD Soft Function F2 (14) to activate Peak Hold function.

164. Wait two seconds and press STORE MEMORY Key (23). Use DATA ENTRY Keypad (22) to select available Memory Location.

165. Press RECALL MEMORY Key (23) and use DATA ENTRY Keypad (22) to select Memory Location selected in Step 164.

166. Press MARKER MODE Key (19) to activate Marker 1.

167. Use DATA SCROLL Spinner (11) to move Marker 1 to highest amplitude level. Verify Marker 1 amplitude is between 15 and 19 dB below Step 144 level. Record level.

168. Press RECALL MEMORY Key (23) and REMOVE Soft Function Key F2 (14). Use DATA ENTRY Keypad (22) to select Memory Location selected in Step 165.

169. Set Function Generator PRF to 0.1 Hz.

170. Use DATA ENTRY Keypad (22) to set internal gain to ***34.0 dB***.

171. Press DSPL MEMORY Key (23) and PK HOLD Soft Function F2 (14) to activate Peak Hold function.

172. Wait ten seconds and press STORE MEMORY Key (23). Use DATA ENTRY Keypad (22) to select available Memory Location.

173. Press RECALL MEMORY Key (23) and use DATA ENTRY Keypad (22) to select Memory Location selected in Step 172.

174. Press MARKER MODE Key (19) to activate Marker 1.

175. Use DATA SCROLL Spinner (11) to move Marker 1 to highest amplitude level. Verify Marker 1 amplitude is between 17 and 21 dB below Step 144 level. Record level.

176. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

177. Disconnect test equipment.

CALIBRATION VERIFICATION

178. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***225 MHz***.

179. Press SPAN FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Frequency Span to ***10 kHz/DIV***.

180. Press SCALE AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set Amplitude Scale per division to ***10 dB***.

181. Connect Signal Generator to ANALYZER INPUT Connector (7).

182. Set Signal Generator for 225 MHz CW. Adjust level to top of screen on CRT (18).

183. Decrease Signal Generator level in 10 dB steps and verify signal on CRT (18) decreases 10 dB for each step.

184. Press DATA SCROLL ↓ Key (4) to set Amplitude Scale per division to ***5 dB***.

185. Adjust Signal Generator level to top of screen on CRT (18).

186. Decrease Signal Generator level in 5 dB steps and verify signal on CRT (18) decreases 5 dB for each step.

187. Press DATA SCROLL ↓ Key (4) to set Amplitude Scale per division to ***2 dB***.

188. Adjust Signal Generator level to top of screen on CRT (18).

189. Decrease Signal Generator level in 1 dB steps and verify signal on CRT (18) decreases 1 dB for each step.

190. Press DATA SCROLL ↓ Key (4) to set Amplitude Scale per division to ***1 dB***.

191. Adjust Signal Generator level to top of screen on CRT (18).

192. Decrease Signal Generator level in 1 dB steps and verify signal on CRT (18) decreases 1 dB for each step.

193. Use DATA ENTRY Keypad (22) to set Amplitude Scale per division to ***10 dB***.

194. Adjust Signal Generator level to first major horizontal below top of screen on CRT (18).

195. Press SPAN FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Frequency Span to ***200 Hz/DIV***.

196. Verify signal remains at first major horizontal below top of screen on CRT (18). If not, adjust FFT IF GAIN as follows:

    - Press CONFIG MEMORY Key (23), RAW CAL Soft Function Key F2 (14), 7 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Det Cal 1 Screen.
    - Use NEXT Soft Function Key F4 (14) or PREV Soft Function Key F3 (14) to move cursor to FFT IF GAIN field.
    - Use DATA SCROLL ↑ and ↓ Keys (4) to increase or decrease IF gain as needed.
    - Press CONFIG MEMORY Key (23) twice to resume prior operation.
    - Verify signal is at first major horizontal below top of screen on CRT (18). If not, repeat Step 196.

197. Adjust Signal Generator level to top of screen on CRT (18).

198. Press SCALE AMPLITUDE Key (21) and LIN Soft Function Key F2 (14) to activate Linear Display mode.

199. Verify signal remains at top of screen on CRT (18). If not, adjust LIN IF GAIN as follows:

- Press CONFIG MEMORY Key (23), RAW CAL Soft Function Key F2 (14), 7 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Det Cal 1 Screen.
- Use NEXT Soft Function Key F4 (14) or PREV Soft Function Key F3 (14) to move cursor to LIN IF GAIN field.
- Use DATA SCROLL ↑ and ↓ Keys (4) to increase or decrease IF gain as needed.
- Press CONFIG MEMORY Key (23) twice to resume prior operation.
- Verify signal is at top of screen on CRT (18). If not, repeat Step 199.

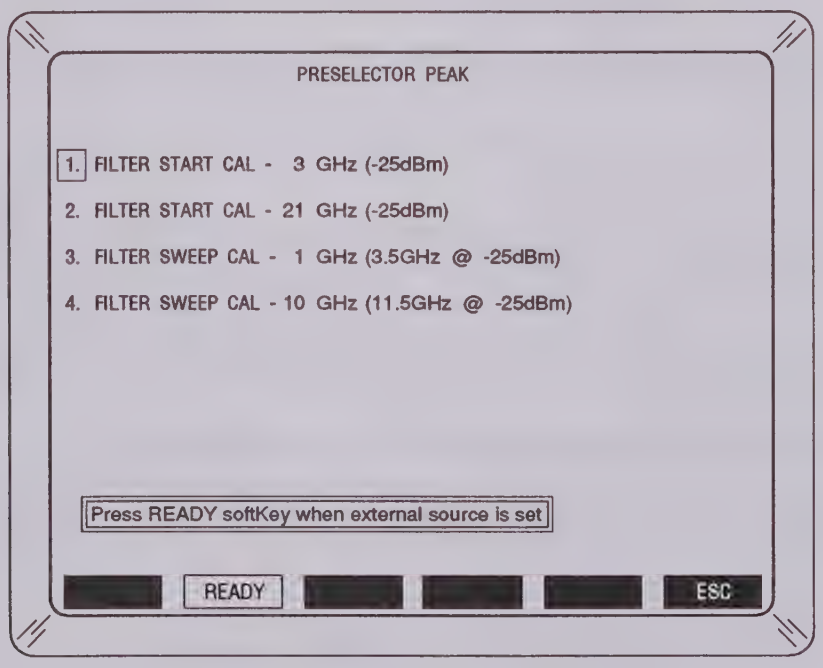
200. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) to restore initial settings.

201. Disconnect Signal Generator from ANALYZER INPUT Connector (7).

PRESELECTOR (N/A for AN920)

202. Press CONFIG MEMORY Key (23), RAW CAL Soft Function Key F2 and REF Soft Function Key F2 (14). Verify PLL is ***LOCKED*** to External 10 MHz Reference.

203. Press CONFIG MEMORY Key (23), ASTD CAL Soft Function Key F5 (14), 2 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Preselector Peak Screen.



7210037

Figure 3-24 Preselector Peak Screen

STEP	PROCEDURE

204. Press 1 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) for 3 GHz Filter Start Calibration.

205. Connect External 10 MHz Reference to Microwave Signal Generator.

206. Connect Microwave Signal Generator to ANALYZER INPUT Connector (7).

207. Set Microwave Signal Generator for 3 GHz CW at -25 dBm.

208. Press READY Soft Function Key F2 (14).

209. When 3 GHz Filter Start Calibration finishes, press 2 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) for 21 GHz Filter Start Calibration.

210. Set Microwave Signal Generator for 21 GHz CW at -25 dBm.

211. Press READY Soft Function Key F2 (14).

212. When 21 GHz Filter Start Calibration finishes, press 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) for 1 GHz Filter Sweep Calibration.

213. Set Microwave Signal Generator for 3.5 GHz CW at -25 dBm.

214. Press READY Soft Function Key F2 (14).

215. When 1 GHz Filter Sweep Calibration finishes, press 4 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) for 10 GHz Filter Sweep Calibration.

216. Set Microwave Signal Generator for 11.5 GHz CW at -25 dBm.

217. Press READY Soft Function Key F2 (14).

218. When 10 GHz Filter Sweep Calibration finishes, disconnect test equipment.

CONVERSION SYSTEM GAIN (7 and 15 GHz) (N/A for AN920)

219. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***7 GHz***.

220. Press SPAN FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Frequency Span to ***10 kHz/DIV***.

221. Press ATTEN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set attenuation to ***0 dB***.

222. Press GAIN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set gain to ***0.0 dB***.

223. Set Microwave Signal Generator for 7 GHz CW at -30 dBm. Verify signal on CRT (18).

224. Press PS AUTO Soft Function Key F3 (14) or press PS MAN Soft Function Key F4 (14) and use DATA SCROLL ↑ and ↓ Keys (4) to peak preselector for maximum signal amplitude.

225. Verify signal level is -30 dBm (±1 dB) on CRT (18). If not, adjust Band 1 conversion system gain as follows:

- Press CONFIG MEMORY Key (23), RAW CAL Soft Function Key F2 (14), 10 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Conversion System Gain Screen. Refer to Figure 3-17.
- Use NEXT Soft Function Key F4 (14) or PREV Soft Function Key F3 (14) to move cursor to Band 1 Conversion System Gain field.
- Use DATA SCROLL ↑ and ↓ Keys (4) to increase or decrease DAC value for Band 1 Conversion System Gain.
- Press CENTER FREQUENCY Key (20) to resume normal operation.
- Verify signal level is -30 dBm (±1 dB). If not, repeat Step 225.

226. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***15 GHz***.

227. Set Microwave Signal Generator for 15 GHz CW at -30 dBm. Verify signal on CRT (18).

228. Press GAIN AMPLITUDE Key (21). Press PS AUTO Soft Function Key F3 (14) or press PS MAN Soft Function Key F4 (14) and use DATA SCROLL ↑ and ↓ Keys (4) to peak preselector for maximum signal amplitude.

229. Verify signal level is -30 dBm (±1 dB) on CRT (18). If not, adjust Band 2 conversion system gain as follows:

- Press CONFIG MEMORY Key (23), RAW CAL Soft Function Key F2 (14), 10 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Conversion System Gain Screen. Refer to Figure 3-17.
- Use NEXT Soft Function Key F4 (14) or PREV Soft Function Key F3 (14) to move cursor to Band 2 Conversion System Gain field.
- Use DATA SCROLL ↑ and ↓ Keys (4) to increase or decrease DAC value for Band 2 Conversion System Gain.
- Press CENTER FREQUENCY Key (20) to resume normal operation.
- Verify signal level is -30 dBm (±1 dB). If not, repeat Step 229.

230. Disconnect Microwave Signal Generator from ANALYZER INPUT Connector (7).

AMPLITUDE CORRECTION

NOTE: Any level requiring more than 8 dB of adjustment indicates a fault requiring repair maintenance.

231. Press ATTEN AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set internal attenuation to ***10 dB***.

232. Press SCALE AMPLITUDE Key (21) and use DATA ENTRY Keypad (22) to set Amplitude Scale per division to ***1 dB***.

233. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***10 MHz***.

234. Connect External 10 MHz Reference to EXT REF IN Connector (33) and Microwave Signal Generator. Refer to Figure 3-25.

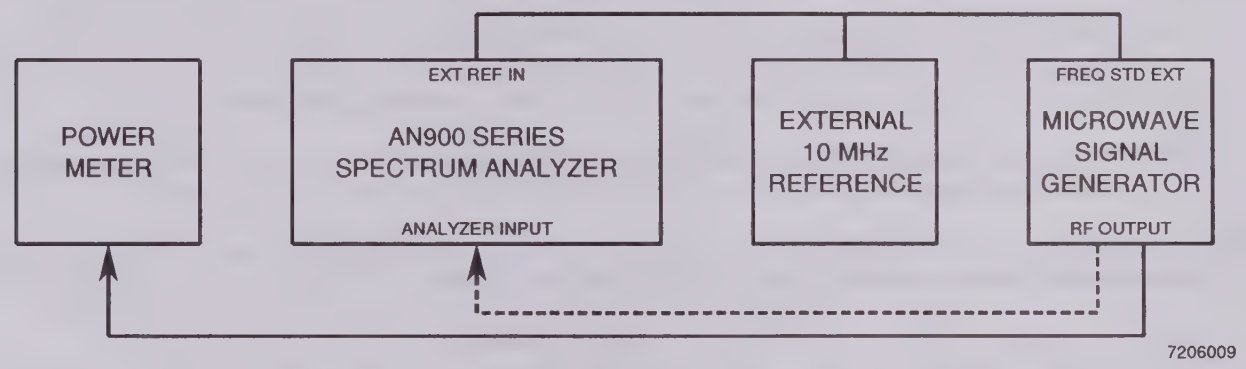


Figure 3-25 Amplitude Correction Test Setup Diagram

235. Connect Microwave Signal Generator to Power Meter (using 10 MHz to 26.5 GHz Power Sensor).

236. Set Micowave Signal Generator for 10 MHz CW at -20 dBm output, verified on Power Meter. Record Microwave Signal Generator level reading.

237. Repeat Step 236 setting Microwave Signal Generator frequency from 100 MHz to 2.9 GHz (AN920), 22 GHz (AN930, AN930A) or 26.5 GHz (AN940) in 100 MHz steps.

NOTE: Once a certain Microwave Signal Generator and cable has been characterized through the applicable frequency range, Steps 236 and 237 may be omitted for future calibrations using the same exact test setup.

238. Disconnect Microwave Signal Generator from Power Meter.

239. Connect Microwave Signal Generator to ANALYZER INPUT Connector (7).

240. Set Microwave Signal Generator for 10 MHz CW at -20 dBm output level setting referenced in Step 236.

241. Verify signal level on CRT (18) is -20 dBm (±1.5 dB). If not, calibrate amplitude correction as follows:

    - Press CONFIG MEMORY Key (23), ASTD CAL Soft Function Key F5 (14), 2 (AN920) or 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Screen.
    - Press 1 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Band 0 (-20 dBm) Screen.
    - Use DATA SCROLL Spinner (11) to set FREQUENCY to current Band 0 test frequency.
    - Press CALIBRATE Soft Function Key F1 (14) to initiate calibration.
    - When unit finishes calibration, press CONFIG MEMORY Key (23) twice to resume normal operation.

242. Repeat Steps 233 and 240 through 241, setting Center Frequency and Microwave Signal Generator from 100 MHz to 2.9 GHz in 100 MHz steps.

    NOTE: Steps 243 through 257 do not apply to AN920.

243. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***5 GHz*** to set operation to Band 1. Use DATA ENTRY Keypad (22) to set Center Frequency to ***2.6 GHz***.

244. Set Micowave Signal Generator for 2.6 GHz CW at -20 dBm output level setting referenced in Step 236.

245. Press GAIN AMPLITUDE Key (21). Press PS AUTO Soft Function Key F3 (14) or PS MAN Soft Function Key F4 (14) and use DATA SCROLL ↑ and ↓ Keys (4) to peak preselector for maximum signal amplitude.

246. Verify signal level on CRT (18) is -20 dBm (±2.0 dB). If not, calibrate amplitude correction as follows:

    - Press CONFIG MEMORY Key (23), ASTD CAL Soft Function Key F5 (14), 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Screen.
    - Press 2 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Band 1 (-20 dBm) Screen.
    - Use DATA SCROLL Spinner (11) to set FREQUENCY to current Band 1 test frequency.
    - Press CALIBRATE Soft Function Key F1 (14) to initiate calibration.
    - When unit finishes calibration, press CONFIG MEMORY Key (23) twice to resume normal operation.

247. Repeat Steps 233 and 244 through 246, setting Center Frequency and Microwave Signal Generator from 2.7 GHz to 12.0 GHz in 100 MHz steps.

248. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***15 GHz*** to set operation to Band 2. Use DATA ENTRY Keypad (22) to set Center Frequency to ***11.5 GHz***.

249. Set Micowave Signal Generator for 11.5 GHz CW at -20 dBm output level setting referenced in Step 236.

250. Press GAIN AMPLITUDE Key (21). Press PS AUTO Soft Function Key F3 (14) or PS MAN Soft Function Key F4 (14) and use DATA SCROLL ↑ and ↓ Keys (4) to peak preselector for maximum signal amplitude.

251. Verify signal level on CRT (18) is -20 dBm (±3.0 dB). If not, calibrate amplitude correction as follows:

    - Press CONFIG MEMORY Key (23), ASTD CAL Soft Function Key F5 (14), 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Screen.
    - Press 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Band 2 (-20 dBm) Screen.
    - Use DATA SCROLL Spinner (11) to set FREQUENCY to current Band 2 test frequency.
    - Press CALIBRATE Soft Function Key F1 (14) to initiate calibration.
    - When unit finishes calibration, press CONFIG MEMORY Key (23) twice to resume normal operation.

252. Repeat Steps 233 and 249 through 251, setting Center Frequency and Microwave Signal Generator from 11.6 GHz to 18.0 GHz in 100 MHz steps.

253. Press CENTER FREQUENCY Key (20) and use DATA ENTRY Keypad (22) to set Center Frequency to ***18 GHz***.

254. Set Micowave Signal Generator for 18 GHz CW at -20 dBm output level setting referenced in Step 236.

255. Press GAIN AMPLITUDE Key (21). Press PS AUTO Soft Function Key F3 (14) or PS MAN Soft Function Key F4 (14) and use DATA SCROLL ↑ and ↓ Keys (4) to peak preselector for maximum signal amplitude.

256. Verify signal level on CRT (18) is -20 dBm (±4.0 dB). If not, calibrate amplitude correction as follows:

- Press CONFIG MEMORY Key (23), ASTD CAL Soft Function Key F5 (14), 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Screen.
- Press 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Amplitude Correction Band 2 (-20 dBm) Screen.
- Use DATA SCROLL Spinner (11) to set FREQUENCY to current Band 2 test frequency.
- Press CALIBRATE Soft Function Key F1 (14) to initiate calibration.
- When unit finishes calibration, press CONFIG MEMORY Key (23) twice to resume normal operation.

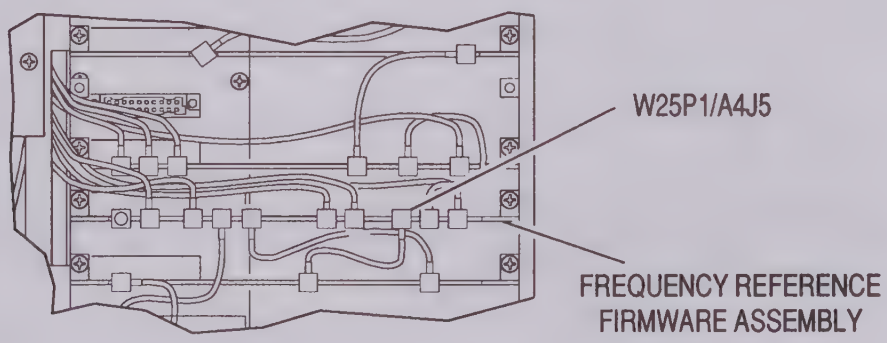
257. Repeat Steps 253 through 256, setting Center Frequency and Microwave Signal Generator from 18.1 GHz to 22.5 GHz (AN930 or AN930A) or 26.5 GHz (AN940).

258. Disconnect test equipment.

259. Press SETUP MEMORY Key (23) and INIT Soft Function Key F5 (14) for initial settings.

TIME BASE

260. Disconnect W25P1 from A4J5 on Frequency Reference Firmware Assembly.



PREFIX ALL REFERENCE DESIGNATOR WITH 72A1 (AN930),
02A1 (AN920), 03A1 (AN930A) OR 04A1 (AN940).

7218029

Figure 3-26 100 MHz LO Signal Cable (W25)

261. Disconnect External 10 MHz reference from EXT REF IN Connector (33).

262. Press CONFIG MEMORY Key (23), 3 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Options Menu.

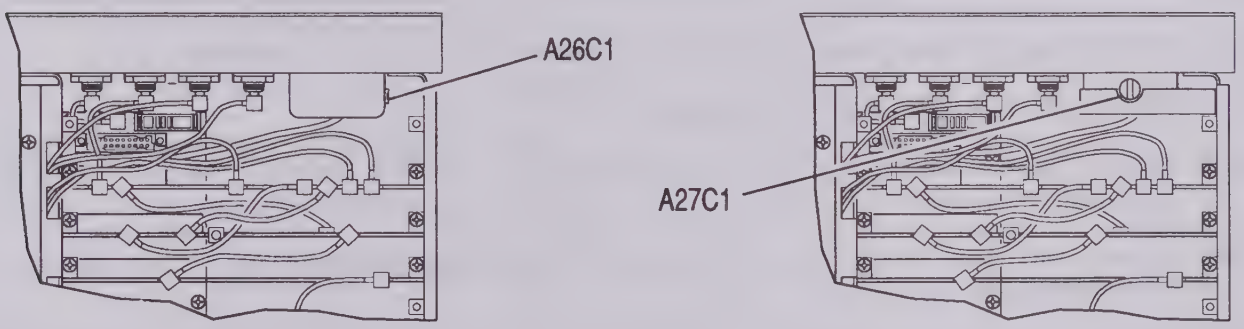
263. Press 9 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14). Use DATA SCROLL ↑ and ↓ Keys (4) to set REFERENCE to ***INT***.

264. Press CONFIG MEMORY Key (23) twice to resume normal operation.

265. Connect External 10 MHz Reference to external Frequency Counter reference input. Connect external Frequency Counter to A4J5 on Frequency Reference Firmware Assembly.

266. Verify signal frequency is 100 MHz (±2 Hz, High Stability Time Base installed), (±50 Hz, Medium Stability Time Base installed) or (±20 Hz, no off board time base installed). If not, perform one of following according to installation:

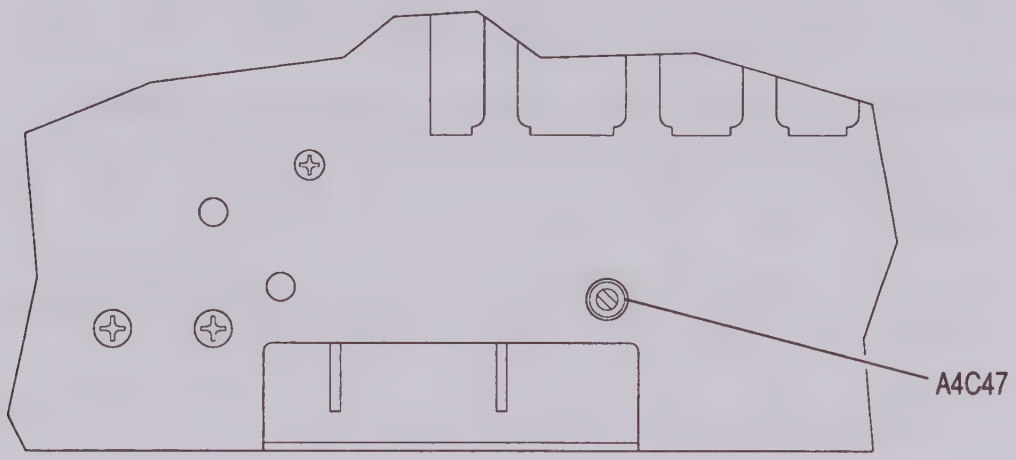
- With High Stability Time Base installed, refer to Figure 3-27 and adjust A26C1 for 100 MHz (±0.5 Hz).
- With Medium Stability Time Base installed, refer to Figure 3-27 and adjust A27C1 for 100 MHz (±10 Hz).
- With no Medium or High Stability Time Base installed (on board Frequency Reference), refer to Figure 3-28 and adjust A4C47 on Frequency Reference Firmware Assembly (right side [from front] of unit) for 100 MHz (±5 Hz).



PREFIX ALL REFERENCE DESIGNATORS WITH 72A1 (AN930)
02A1 (AN920), 03A1 (AN930A) OR 04A1 (AN940).

7218027

Figure 3-27 Off Board Time Base Adjustments



PREFIX ALL REFERENCE DESIGNATORS WITH 72A1 (AN930)
02A1 (AN920), 03A1 (AN930A) OR 04A1 (AN940).

7218028

Figure 3-28 On Board Frequency Reference Adjustment

267. Disconnect Frequency Counter from A4J5 on Frequency Reference Firmware Assembly.

268. Connect W25P1 from A4J5 on Frequency Reference Firmware Assembly.

TRACKING GENERATOR (OPTION 02)

269. Press CONFIG MEMORY Key (23) and ASTD CAL Soft Function Key F5 (14) to enter Assisted Calibration Screen.

270. Press 1 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) to enter Internal Calibrations Screen.

271. Press 3 (AN920) or 4 on DATA ENTRY Keypad (22) and ENTER Soft Function Key F1 (14) for Tracking Generator calibration.

272. Connect Tracking Generator Test Cable to TRACKING GENERATOR Connector (13) and ANALYZER INPUT Connector (7).

273. Press READY Soft Function Key F2 (14) to intitiate Tracking Generator calibration.

274. Verify Tracking Generator passed calibration.

275. Press ENTER Soft Function Key F1 (14).

276. Disconnect Tracking Generator Test Cable from TRACKING GENERATOR Connector (13) and ANALYZER INPUT Connector (7).

277. Verify Tracking Generator according to 3-4-9.

3-7 CALIBRATION DATA SHEET

Technician: _____ S/N: _____

Model: _____ Date: _____

STEP	DATA	RESULT
3-6-1	**POWER SUPPLY**	
1.	+12 V SWEEP (YIG) Resistance ≥100 Ω	_____
2.	+12 V SWEEP Resistance ≥100 Ω	_____
3.	+12 V (Analog) Resistance ≥100 Ω	_____
4.	-12 V (Analog) Resistance ≥100 Ω	_____
5.	+5 V (Analog) Resistance ≥5 Ω	_____
6.	+35 V Resistance ≥100 Ω	_____
7.	+12 V (Digital) Resistance ≥100 Ω	_____
8.	-12 V (Digital) Resistance ≥100 Ω	_____
9.	+5 V (Digital) Resistance ≥10 Ω	_____
10.	+5 V (Digital) Resistance ≥10 Ω	_____
11.	+12 V CRT Resistance ≥30 Ω	_____
12.	+12 V FAN Resistance ≥30 Ω	_____
13.	+12 V (Time Base) Resistance ≥100 Ω	_____
14.	BAT IN Connector (36) Resistance ≥100 Ω	_____
15.	POWER ON Indicator (15) illuminates.	_____(√)
16.	+12 V SWEEP (YIG) +12 Vdc (11.75 to 12.25 V)	_____
17.	+12 V SWEEP +12 Vdc (11.75 to 12.25 V)	_____
18.	+12 V (Analog) +12 Vdc (11.75 to 12.25 V)	_____
19.	-12 V (Analog) -12 Vdc (12.25 to -11.75 V)	_____
20.	+5 V (Analog) +5 Vdc (4.9 to 5.1 V)	_____
21.	+35 Vdc (34 to 36 V)	_____

STEP	DATA	RESULT
22.	+12 V (Digital) +12 Vdc (11.75 to 12.25 V)	_____
23.	-12 V (Digital) -12 Vdc (-12.25 to -11.75 V)	_____
24.	+5 V (Digital) +5 Vdc (4.85 to 5.25 V)	_____
25.	+5 V (Digital) +5 Vdc (4.85 to 5.25 V)	_____
26.	+12 V CRT +12 Vdc (11.75 to 12.25 V)	_____
27.	+12 V FAN +12 Vdc (11.75 to 12.25 V)	_____
28.	+12 V (Time Base) +12 Vdc (11.75 to 12.25 V)	_____
29.	BAT IN Connector (36) +13.8 Vdc (13.6 to 14.0 V)	_____

3-6-2 SYSTEM CALIBRATION

REFERENCE LOCK VERIFICATION

9.	PLL is ***LOCKED*** to External 10 MHz Reference.	_____ (√)

CRT BRIGHTNESS

12.	Raster is not visible.	_____ (√)

CONVERSION SYSTEM GAIN (100 MHz)

35.	CRT (18) displays signal.	_____ (√)
38.	Band 0, 10.7 MHz Signal Level -3 dBm (-4 to -2 dBm)	_____

AM/FM DETECTORS

69.	5 MHz FM with 5 MHz/Div Scale 2 Divisions Peak-to-Peak	_____ (√)
70.	4 MHz FM with 2 MHz/Div Scale 4 Divisions Peak-to-Peak	_____ (√)
	3 MHz FM with 1 MHz/Div Scale 6 Divisions Peak-to-Peak	_____ (√)
	1.5 MHz FM with 500 kHz/Div Scale 6 Divisions Peak-to-Peak	_____ (√)
	600 kHz FM with 200 kHz/Div Scale 6 Divisions Peak-to-Peak	_____ (√)
	300 kHz FM with 100 kHz/Div Scale 6 Divisions Peak-to-Peak	_____ (√)
	150 kHz FM with 50 kHz/Div Scale 6 Divisions Peak-to-Peak	_____ (√)
	60 kHz FM with 20 kHz/Div Scale 6 Divisions Peak-to-Peak	_____ (√)
	30 kHz FM with 10 kHz/Div Scale 6 Divisions Peak-to-Peak	_____ (√)
	15 kHz FM with 5 kHz/Div Scale 6 Divisions Peak-to-Peak	_____ (√)

STEP	DATA	RESULT
70. (Cont)	6 kHz FM with 2 kHz/Div Scale 6 Divisions Peak-to-Peak	_____(√)
	3 kHz FM with 1 kHz/Div Scale 6 Divisions Peak-to-Peak	_____(√)
	30% AM with 10%/Div Scale 6 Divisions Peak-to-Peak	_____(√)
	60% AM with 20%/Div Scale 6 Divisions Peak-to-Peak	_____(√)
	50% AM with 50%/Div Scale 2 Divisions Peak-to-Peak	_____(√)
	SCOPE AMPLITUDE	
79.	CRT (18) displays 1 kHz square wave.	_____(√)
83.	Scope Amplitude Level Probe Adjust Output Level (±24 mV)	_____
	QUASI-PEAK DETECTOR (OPTION 08)	
95.	120 kHz RBW Signal Level 60 dBµV (59 to 61 dBµV)	_____
97.	9 kHz RBW Signal Level 60 dBµV (59 to 61 dBµV)	_____
99.	200 Hz RBW Signal Level 60 dBµV (59 to 61 dBµV)	_____
102.	100 MHz CW -17.1 dBm Signal Generator Level Reference	_____
103.	100 MHz CW -14.0 dBm Signal Generator Level Reference	_____
104.	100 MHz CW -13.4 dBm Signal Generator Level Reference	_____
109.	1 µs Pulse/100 Hz PRF/120 kHz RBW Step 95 Level (±1 dB)	_____
112.	1 µs Pulse/1 kHz PRF/120 kHz RBW Step 109 Level + 6.5 dB to Step 109 Level + 9.5 dB	_____
115.	1 µs Pulse/20 Hz PRF/120 kHz RBW Step 109 Level - 10.5 dB to Step 109 Level - 7.5 dB	_____
117.	1 µs Pulse/10 Hz PRF/120 kHz RBW Step 109 Level - 15.5 dB to Step 109 Level - 12.5 dB	_____
119.	1 µs Pulse/5 Hz PRF/120 kHz RBW Step 109 Level - 22 dB to Step 109 Level - 18 dB	_____
124.	5 µs Pulse/100 Hz PRF/9 kHz RBW Step 97 Level (±1 dB)	_____
127.	5 µs Pulse/1 kHz PRF/9 kHz RBW Step 124 Level + 3.5 dB to Step 124 Level + 5.5 dB	_____
130.	5 µs Pulse/20 Hz PRF/9 kHz RBW Step 124 Level - 7.5 dB to Step 124 Level - 5.5 dB	_____

STEP	DATA	RESULT
132.	5 µs Pulse/10 Hz PRF/9 kHz RBW Step 124 Level - 11.5 dB to Step 124 Level - 8.5 dB	_____
138.	5 µs Pulse/2 Hz PRF/9 kHz RBW Step 124 Level - 22.5 dB to Step 124 Level - 18.5 dB	_____
144.	200 µs Pulse/25 Hz PRF/200 Hz RBW Step 99 Level (±1 dB)	_____
147.	200 µs Pulse/60 Hz PRF/200 Hz RBW Step 144 Level + 2 dB to Step 148 Level + 4 dB	_____
149.	200 µs Pulse/100 Hz PRF/200 Hz RBW Step 144 Level + 3 dB to Step 144 Level + 5 dB	_____
152.	200 µs Pulse/10 Hz PRF/200 Hz RBW Step 144 Level - 5 dB to Step 144 Level - 3 dB	_____
154.	200 µs Pulse/5 Hz PRF/200 Hz RBW Step 144 Level - 9 dB to Step 144 Level - 6 dB	_____
160.	200 µs Pulse/2 Hz PRF/200 Hz RBW Step 144 Level - 15 dB to Step 144 Level - 11 dB	_____
167.	200 µs Pulse/1 Hz PRF/200 Hz RBW Step 144 Level - 19 dB to Step 144 Level - 15 dB	_____
175.	200 µs Pulse/0.1 Hz PRF/200 Hz RBW Step 144 Level - 21 dB to Step 144 Level - 17 dB	_____
	CALIBRATION VERIFICATION	
183.	10 dB Amplitude Scale 10 dB steps	_____ (√)
186.	5 dB Amplitude Scale 5 dB steps	_____ (√)
189.	2 dB Amplitude Scale 1 dB steps	_____ (√)
192.	1 dB Amplitude Scale 1 dB steps	_____ (√)
196.	FFT CRT (18) displays signal at first major horizontal below top of screen.	_____ (√)
199.	Linear Display mode CRT (18) displays signal at top of screen.	_____ (√)
	PRESELECTOR	
202.	PLL is ***LOCKED*** to External 10 MHz Reference.	_____ (√)
	CONVERSION SYSTEM GAIN (100 MHz)	
223.	CRT (18) displays signal.	_____ (√)
225.	Band 1, 7 GHz Signal Level -30 dBm (-31 to -29 dBm)	_____

STEP	DATA	RESULT
227.	CRT (18) displays signal.	_____(√)
229.	Band 2, 15 MHz Signal Level -30 dBm (-31 to -29 dBm)	_____

AMPLITUDE CORRECTION

236./237.

FREQUENCY	dBm LEVEL	FREQUENCY	dBm LEVEL	FREQUENCY	dBm LEVEL
10 MHz		2.8 GHz		5.6 GHz	
100 MHz		2.9 GHz		5.7 GHz	
200 MHz		3.0 GHz		5.8 GHz	
300 MHz		3.1 GHz		5.9 GHz	
400 MHz		3.2 GHz		6.0 GHz	
500 MHz		3.3 GHz		6.1 GHz	
600 MHz		3.4 GHz		6.2 GHz	
700 MHz		3.5 GHz		6.3 GHz	
800 MHz		3.6 GHz		6.4 GHz	
900 MHz		3.7 GHz		6.5 GHz	
1.0 GHz		3.8 GHz		6.6 GHz	
1.1 GHz		3.9 GHz		6.7 GHz	
1.2 GHz		4.0 GHz		6.8 GHz	
1.3 GHz		4.1 GHz		6.9 GHz	
1.4 GHz		4.2 GHz		7.0 GHz	
1.5 GHz		4.3 GHz		7.1 GHz	
1.6 GHz		4.4 GHz		7.2 GHz	
1.7 GHz		4.5 GHz		7.3 GHz	
1.8 GHz		4.6 GHz		7.4 GHz	
1.9 GHz		4.7 GHz		7.5 GHz	
2.0 GHz		4.8 GHz		7.6 GHz	
2.1 GHz		4.9 GHz		7.7 GHz	
2.2 GHz		5.0 GHz		7.8 GHz	
2.3 GHz		5.1 GHz		7.9 GHz	
2.4 GHz		5.2 GHz		8.0 GHz	
2.5 GHz		5.3 GHz		8.1 GHz	
2.6 GHz		5.4 GHz		8.2 GHz	
2.7 GHz		5.5 GHz		8.3 GHz	

Table 3-3 Microwave Signal Generator -20 dBm Reference Levels

237. (Cont)

FREQUENCY	dBm LEVEL	FREQUENCY	dBm LEVEL	FREQUENCY	dBm LEVEL
8.4 GHz		11.6 GHz		14.8 GHz	
8.5 GHz		11.7 GHz		14.9 GHz	
8.6 GHz		11.8 GHz		15.0 GHz	
8.7 GHz		11.9 GHz		15.1 GHz	
8.8 GHz		12.0 GHz		15.2 GHz	
8.9 GHz		12.1 GHz		15.3 GHz	
9.0 GHz		12.2 GHz		15.4 GHz	
9.1 GHz		12.3 GHz		15.5 GHz	
9.2 GHz		12.4 GHz		15.6 GHz	
9.3 GHz		12.5 GHz		15.7 GHz	
9.4 GHz		12.6 GHz		15.8 GHz	
9.5 GHz		12.7 GHz		15.9 GHz	
9.6 GHz		12.8 GHz		16.0 GHz	
9.7 GHz		12.9 GHz		16.1 GHz	
9.8 GHz		13.0 GHz		16.2 GHz	
9.9 GHz		13.1 GHz		16.3 GHz	
10.0 GHz		13.2 GHz		16.4 GHz	
10.1 GHz		13.3 GHz		16.5 GHz	
10.2 GHz		13.4 GHz		16.6 GHz	
10.3 GHz		13.5 GHz		16.7 GHz	
10.4 GHz		13.6 GHz		16.8 GHz	
10.5 GHz		13.7 GHz		16.9 GHz	
10.6 GHz		13.8 GHz		17.0 GHz	
10.7 GHz		13.9 GHz		17.1 GHz	
10.8 GHz		14.0 GHz		17.2 GHz	
10.9 GHz		14.1 GHz		17.3 GHz	
11.0 GHz		14.2 GHz		17.4 GHz	
11.1 GHz		14.3 GHz		17.5 GHz	
11.2 GHz		14.4 GHz		17.6 GHz	
11.3 GHz		14.5 GHz		17.7 GHz	
11.4 GHz		14.6 GHz		17.8 GHz	
11.5 GHz		14.7 GHz		17.9 GHz	

Table 3-3 Microwave Signal Generator -20 dBm Reference Levels (Cont)

237. (Cont)

FREQUENCY	dBm LEVEL	FREQUENCY	dBm LEVEL	FREQUENCY	dBm LEVEL
18.0 GHz		20.9 GHz		23.8 GHz	
18.1 GHz		21.0 GHz		23.9 GHz	
18.2 GHz		21.1 GHz		24.0 GHz	
18.3 GHz		21.2 GHz		24.1 GHz	
18.4 GHz		21.3 GHz		24.2 GHz	
18.5 GHz		21. GHz		24.3 GHz	
18.6 GHz		21.5 GHz		24.4 GHz	
18.7 GHz		21.6 GHz		24.5 GHz	
18.8 GHz		21.7 GHz		24.6 GHz	
18.9 GHz		21.8 GHz		24.7 GHz	
19.0 GHz		21.9 GHz		24.8 GHz	
19.1 GHz		22.0 GHz		24.9 GHz	
19.2 GHz		22.1 GHz		25.0 GHz	
19.3 GHz		22.2 GHz		25.1 GHz	
19.4 GHz		22.3 GHz		25.2 GHz	
19.5 GHz		22.4 GHz		25.3 GHz	
19.6 GHz		22.5 GHz		25.4 GHz	
19.7 GHz		22.6 GHz		25.5 GHz	
19.8 GHz		22.7 GHz		25.6 GHz	
19.9 GHz		22.8 GHz		25.7 GHz	
20.0 GHz		22.9 GHz		25.8 GHz	
20.1 GHz		23.0 GHz		25.9 GHz	
20.2 GHz		23.1 GHz		26.0 GHz	
20.3 GHz		23.2 GHz		26.1 GHz	
20.4 GHz		23.3 GHz		26.2 GHz	
20.5 GHz		23.4 GHz		26.3 GHz	
20.6 GHz		23.5 GHz		26.4 GHz	
20.7 GHz		23.6 GHz		26.5 GHz	
20.8 GHz		23.7GHz			

NOTE: Frequencies >2.9 GHz do not apply to AN920. Frequencies >22 GHz only apply to AN940.

Table 3-3 Microwave Signal Generator -20 dBm Reference Levels (Cont)

STEP	DATA	RESULT
241.	Band 0 Frequencies/Signal Level 10 MHz -20 dBm (-21.5 to -18.5 dBm)	_____
242.	100 MHz -20 dBm (-21.5 to -18.5 dBm)	_____
	200 MHz -20 dBm (-21.5 to -18.5 dBm)	_____
	300 MHz -20 dBm (-21.5 to -18.5 dBm)	_____
	400 MHz -20 dBm (-21.5 to -18.5 dBm)	_____
	500 MHz -20 dBm (-21.5 to -18.5 dBm)	_____
	600 MHz -20 dBm (-21.5 to -18.5 dBm)	_____
	700 MHz -20 dBm (-21.5 to -18.5 dBm)	_____
	800 MHz -20 dBm (-21.5 to -18.5 dBm)	_____
	900 MHz -20 dBm (-21.5 to -18.5 dBm)	_____
	1.0 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	1.1 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	1.2 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	1.3 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	1.4 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	1.5 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	1.6 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	1.7 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	1.8 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	1.9 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	2.0 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	2.1 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	2.2 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	2.3 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	2.4 GHz -20 dBm (-21.5 to -18.5 dBm)	_____
	2.5 GHz -20 dBm (-21.5 to -18.5 dBm)	_____

STEP	DATA	RESULT
242. (Cont)	2.6 GHz -20 dBm (-21.5 to -18.5 dBm)	
	2.7 GHz -20 dBm (-21.5 to -18.5 dBm)	
	2.8 GHz -20 dBm (-21.5 to -18.5 dBm)	
	2.9 GHz -20 dBm (-21.5 to -18.5 dBm)	
246.	Band 1 Frequencies/Signal Level (N/A for AN920) 2.6 GHz -20 dBm (-22 to -18 dBm)	
247.	(N/A for AN920) 2.7 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 2.8 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 2.9 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 3.0 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 3.1 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 3.2 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 3.3 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 3.4 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 3.5 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 3.6 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 3.7 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 3.8 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 3.9 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 4.0 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 4.1 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 4.2 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 4.3 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 4.4 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 4.5 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 4.6 GHz -20 dBm (-22 to -18 dBm)	
	(N/A for AN920) 4.7 GHz -20 dBm (-22 to -18 dBm)	

STEP	DATA	RESULT
246. (Cont)	(N/A for AN920) 4.8 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 4.9 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 5.0 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 5.1 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 5.2 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 5.3 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 5.4 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 5.5 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 5.6 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 5.7 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 5.8 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 5.9 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 6.0 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 6.1 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 6.2 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 6.3 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 6.4 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 6.5 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 6.6 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 6.7 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 6.8 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 6.9 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 7.0 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 7.1 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 7.2 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 7.3 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 7.4 GHz -20 dBm (-22 to -18 dBm)	_____

STEP	DATA	RESULT
247. (Cont)	(N/A for AN920) 7.5 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 7.6 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 7.7 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 7.8 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 7.9 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 8.0 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 8.1 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 8.2 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 8.3 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 8.4 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 8.5 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 8.6 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 8.7 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 8.8 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 8.9 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 9.0 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 9.1 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 9.2 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 9.3 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 9.4 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 9.5 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 9.6 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 9.7 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 9.8 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 9.9 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 10.0 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 10.1 GHz -20 dBm (-22 to -18 dBm)	_____

STEP	DATA	RESULT
247. (Cont)	(N/A for AN920) 10.2 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 10.3 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 10.4 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 10.5 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 10.6 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 10.7 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 10.8 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 10.9 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 11.0 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 11.1 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 11.2 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 11.3 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 11.4 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 11.5 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 11.6 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 11.7 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 11.8 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 11.9 GHz -20 dBm (-22 to -18 dBm)	_____
	(N/A for AN920) 12.0 GHz -20 dBm (-22 to -18 dBm)	_____
251.	Band 2 Frequencies/Signal Level (N/A for AN920) 11.5 GHz -20 dBm (-23 to -17 dBm)	_____
252.	(N/A for AN920) 11.6 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 11.7 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 11.8 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 11.9 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 12.0 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 12.1 GHz -20 dBm (-23 to -17 dBm)	_____

STEP	DATA	RESULT
252. (Cont)	(N/A for AN920) 12.2 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 12.3 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 12.4 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 12.5 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 12.6 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 12.7 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 12.8 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 12.9 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 13.0 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 13.1 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 13.2 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 13.3 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 13.4 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 13.5 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 13.6 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 13.7 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 13.8 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 13.9 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 14.0 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 14.1 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 14.2 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 14.3 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 14.4 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 14.5 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 14.6 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 14.7 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 14.8 GHz -20 dBm (-23 to -17 dBm)	_____

STEP	DATA	RESULT
252. (Cont)	(N/A for AN920) 14.9 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 15.0 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 15.1 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 15.2 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 15.3 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 15.4 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 15.5 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 15.6 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 15.7 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 15.8 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 15.9 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 16.0 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 16.1 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 16.2 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 16.3 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 16.4 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 16.5 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 16.6 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 16.7 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 16.8 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 16.9 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 17.0 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 17.1 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 17.2 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 17.3 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 17.4 GHz -20 dBm (-23 to -17 dBm)	_____
	(N/A for AN920) 17.5 GHz -20 dBm (-23 to -17 dBm)	_____

STEP	DATA	RESULT
252. (Cont)	(N/A for AN920) 17.6 GHz -20 dBm (-23 to -17 dBm)	
	(N/A for AN920) 17.7 GHz -20 dBm (-23 to -17 dBm)	
	(N/A for AN920) 17.8 GHz -20 dBm (-23 to -17 dBm)	
	(N/A for AN920) 17.9 GHz -20 dBm (-23 to -17 dBm)	
	(N/A for AN920) 18.0 GHz -20 dBm (-23 to -17 dBm)	
256.	Band 2 Frequencies/Signal Level (N/A for AN920) 18.0 GHz -20 dBm (-24 to -16 dBm)	
257.	(N/A for AN920) 18.1 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 18.2 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 18.3 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 18.4 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 18.5 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 18.6 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 18.7 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 18.8 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 18.9 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 19.0 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 19.1 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 19.2 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 19.3 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 19.4 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 19.5 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 19.6 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 19.7 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 19.8 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 19.9 GHz -20 dBm (-24 to -16 dBm)	
	(N/A for AN920) 20.0 GHz -20 dBm (-24 to -16 dBm)	

STEP	DATA	RESULT
257. (Cont)	(N/A for AN920) 20.1 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 20.2 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 20.3 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 20.4 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 20.5 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 20.6 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 20.7 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 20.8 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 20.9 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 21.0 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 21.1 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 21.2 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 21.3 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 21.4 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 21.5 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 21.6 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 21.7 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 21.8 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 21.9 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 22.0 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 22.1 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 22.2 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 22.3 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 22.4 GHz -20 dBm (-24 to -16 dBm)	_____
	(N/A for AN920) 22.5 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 22.6 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 22.7 GHz -20 dBm (-24 to -16 dBm)	_____

STEP	DATA	RESULT
257. (Cont)	(Only for AN940) 22.8 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 22.9 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 23.0 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 23.1 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 23.2 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 23.3 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 23.4 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 23.5 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 23.6 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 23.7 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 23.8 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 23.9 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 24.0 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 24.1 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 24.2 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 24.3 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 24.4 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 24.5 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 24.6 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 24.7 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 24.8 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 24.9 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 25.0 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 25.1 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 25.2 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 25.3 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 25.4 GHz -20 dBm (-24 to -16 dBm)	_____

STEP	DATA	RESULT
257. (Cont)	(Only for AN940) 25.5 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 25.6 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 25.7 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 25.8 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 25.9 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 26.0 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 26.1 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 26.2 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 26.3 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 26.4 GHz -20 dBm (-24 to -16 dBm)	_____
	(Only for AN940) 26.5 GHz -20 dBm (-24 to -16 dBm)	_____
	TIME BASE	
266.	Signal Frequency 100 MHz (99.999998 to 100.000002 MHz, High Stability Time Base installed), (99.99995 to 100.00005 MHz, Medium Stability Time Base installed) or (99.99998 to 100.00002 MHz, no off board time base installed)	_____
	TRACKING GENERATOR (OPTION 02)	
274.	Tracking Generator passed calibration.	_____ (√)
277.	Verified Tracking Generator according to 3-4-9 Tracking Generator Verification	_____ (√)

SECTION 4 - REPLACEMENT PROCEDURES

4-1 GENERAL

This section contains instructions for replacement of any assembly contained in the unit. The instructions given are for removal of each assembly. Prerequisite instructions are listed as needed. Reassembly is in reverse order of removal instructions unless otherwise noted. Refer to applicable wiring drawings in Section 6 to verify cable location, if necessary.

CAUTION: DAMAGE TO A RIGID COAXIAL CABLE MAY RESULT WHEN DISCONNECTING ONE END, IF OTHER END IS NOT LOOSENED FIRST.

4-1-1 SAFETY PRECAUTIONS

Power should be removed from the unit before any replacement procedure is initiated.

WARNING: DANGEROUS VOLTAGES ARE PRESENT WITH CASE ASSEMBLIES REMOVED IF POWER IS PRESENT.

4-1-2 ESD PRECAUTIONS

CAUTION: THE REPLACEMENT PROCEDURES FOR THE AN900 SERIES SPECTRUM ANALYZER SHOULD ONLY BE PERFORMED IN AN ESD ENVIRONMENT AND ALL PERSONNEL PERFORMING THE REPLACEMENT PROCEDURES SHOULD HAVE KNOWLEDGE OF ACCEPTED ESD PRACTICES AND/OR BE ESD CERTIFIED.

4-2 EQUIPMENT REQUIREMENTS

TOOL	SIZE
WRENCH, OPEN END	5/16"
NUT DRIVER	5/16" and 3/4" (deep)
SCREWDRIVER	slotted and phillips type

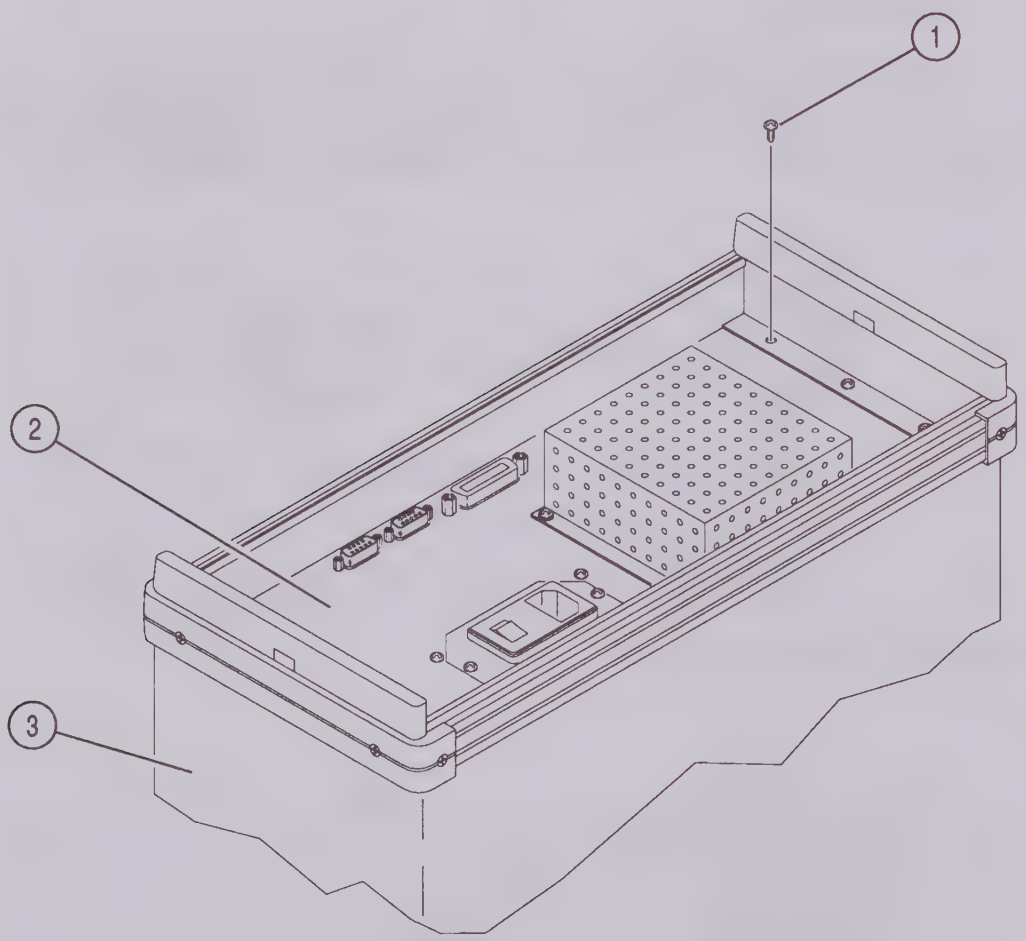
4-3 REPLACEMENT PROCEDURES

4-3-1 CASE ASSEMBLY

WARNING: DANGEROUS VOLTAGES ARE PRESENT WITH CASE ASSEMBLIES REMOVED IF POWER IS PRESENT.

STEP	PROCEDURE

1. Disconnect ac power.
2. Set unit (nothing connected to front panel connectors) with front panel face down.
3. Remove six screws (1).
4. Slide Case Assembly (3) up and off of Chassis Assembly (2).



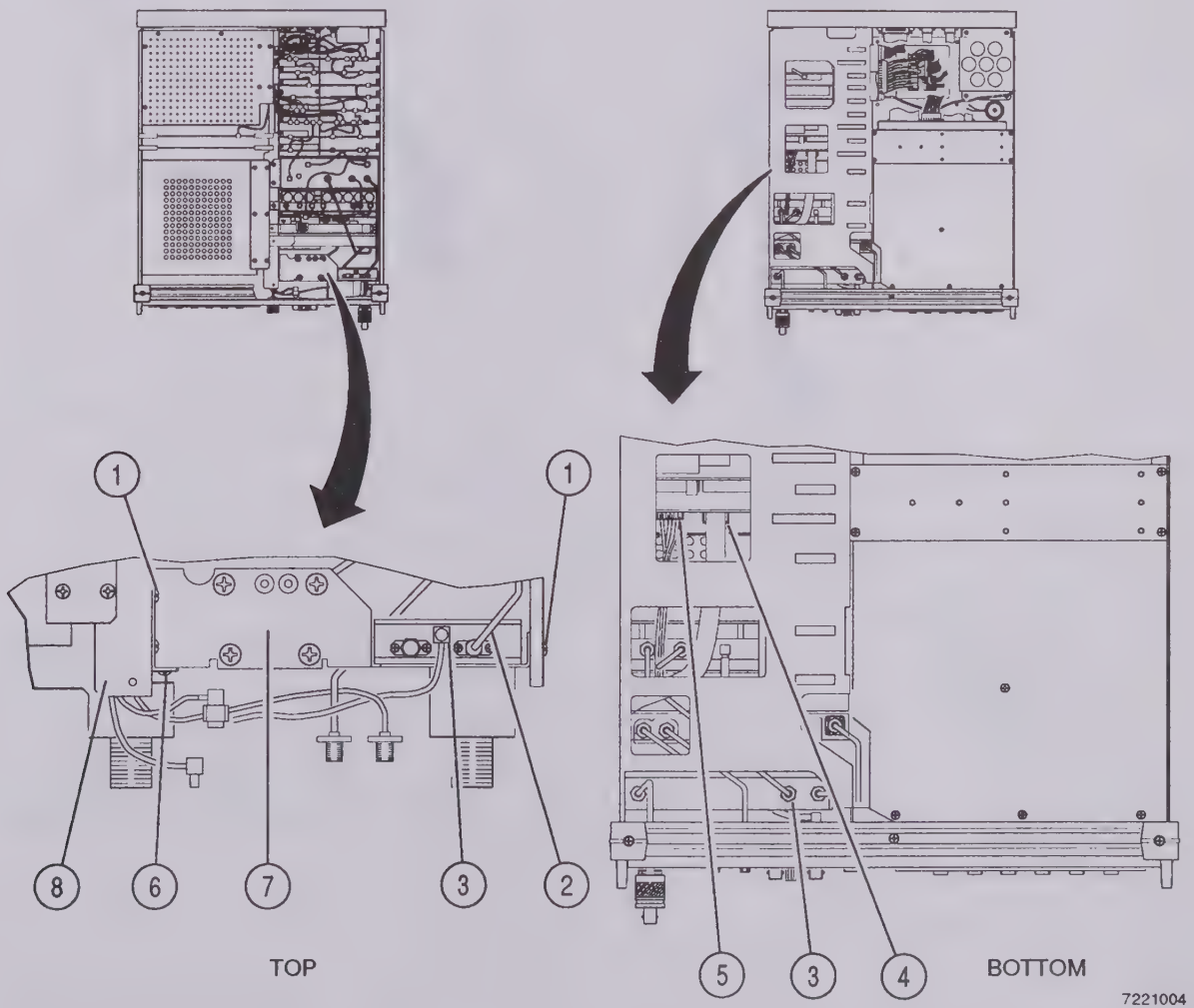
7221001

4-3-2 MICROWAVE RECEIVER ASSEMBLY (AN930, AN930A, AN940)

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).
Remove Front Panel Assembly (4-3-19).

STEP	PROCEDURE

1. Remove four screws (1) (two right side, two inside).
2. Remove coaxial cable (2).
3. Disconnect two coaxial cable connectors (3).
4. Disconnect ribbon cable connector (4) and wire cable connector (5).
5. Remove two screws (6).
6. Remove Microwave Receiver Assembly (7), carefully routing cables out of Chassis Assembly (8).

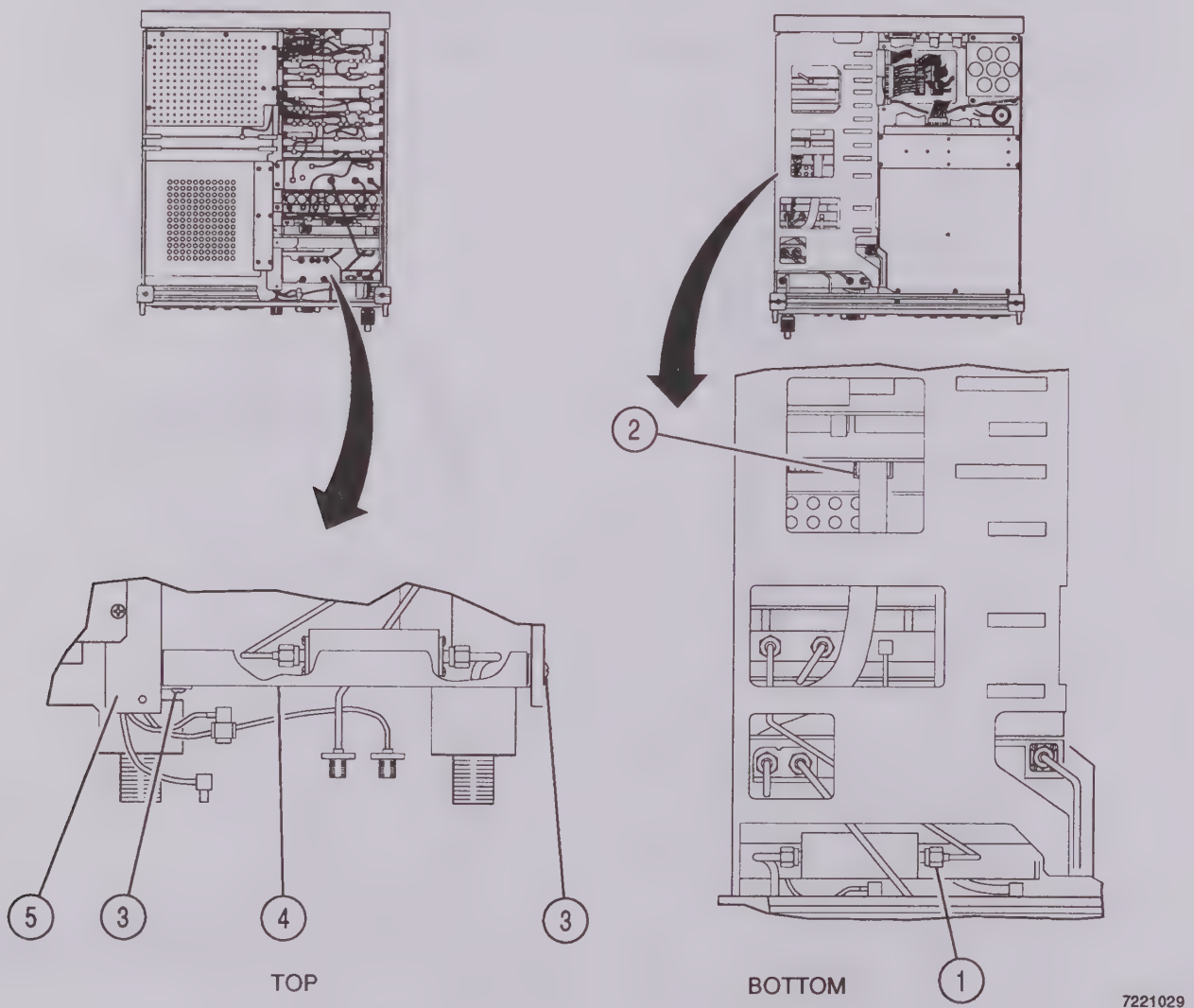


4-3-3 ATTENUATOR ASSEMBLY (AN920)

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).
Remove Front Panel Assembly (4-3-19).

STEP PROCEDURE

1. Disconnect coaxial cable connector (1).
2. Disconnect ribbon cable connector (2).
3. Remove four screws (3).
4. Remove Attenuator Assembly (4), carefully routing cable out of Chassis Assembly (5).

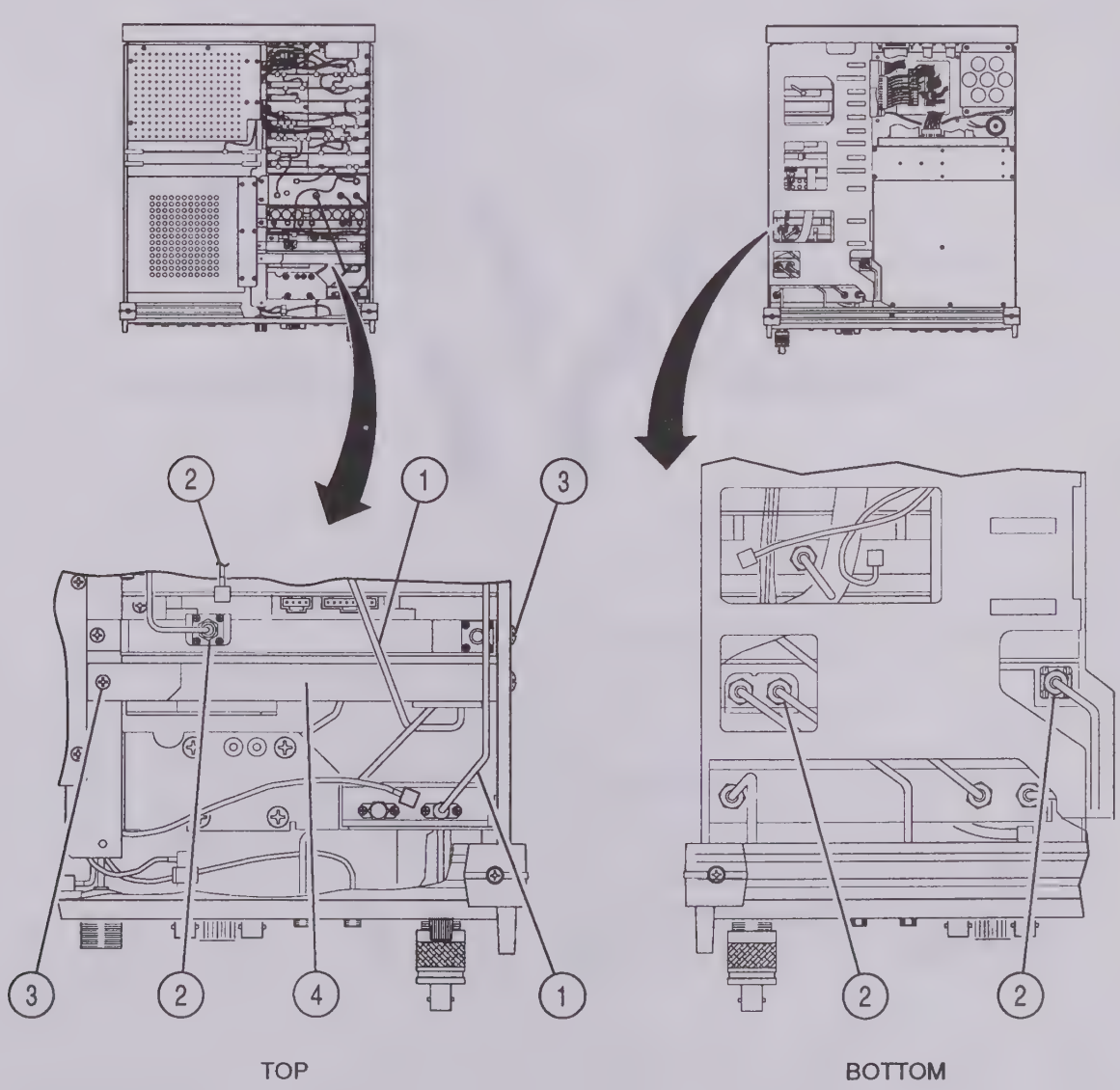


4-3-4 TRACKING GENERATOR ASSEMBLY (OPTION 02)

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Remove one (AN920) or two coaxial cables (1).
2. Disconnect four coaxial cable connectors (2).
3. Remove six screws (3) (four right side, two top).
4. Remove Tracking Generator Assembly (4).



7221005

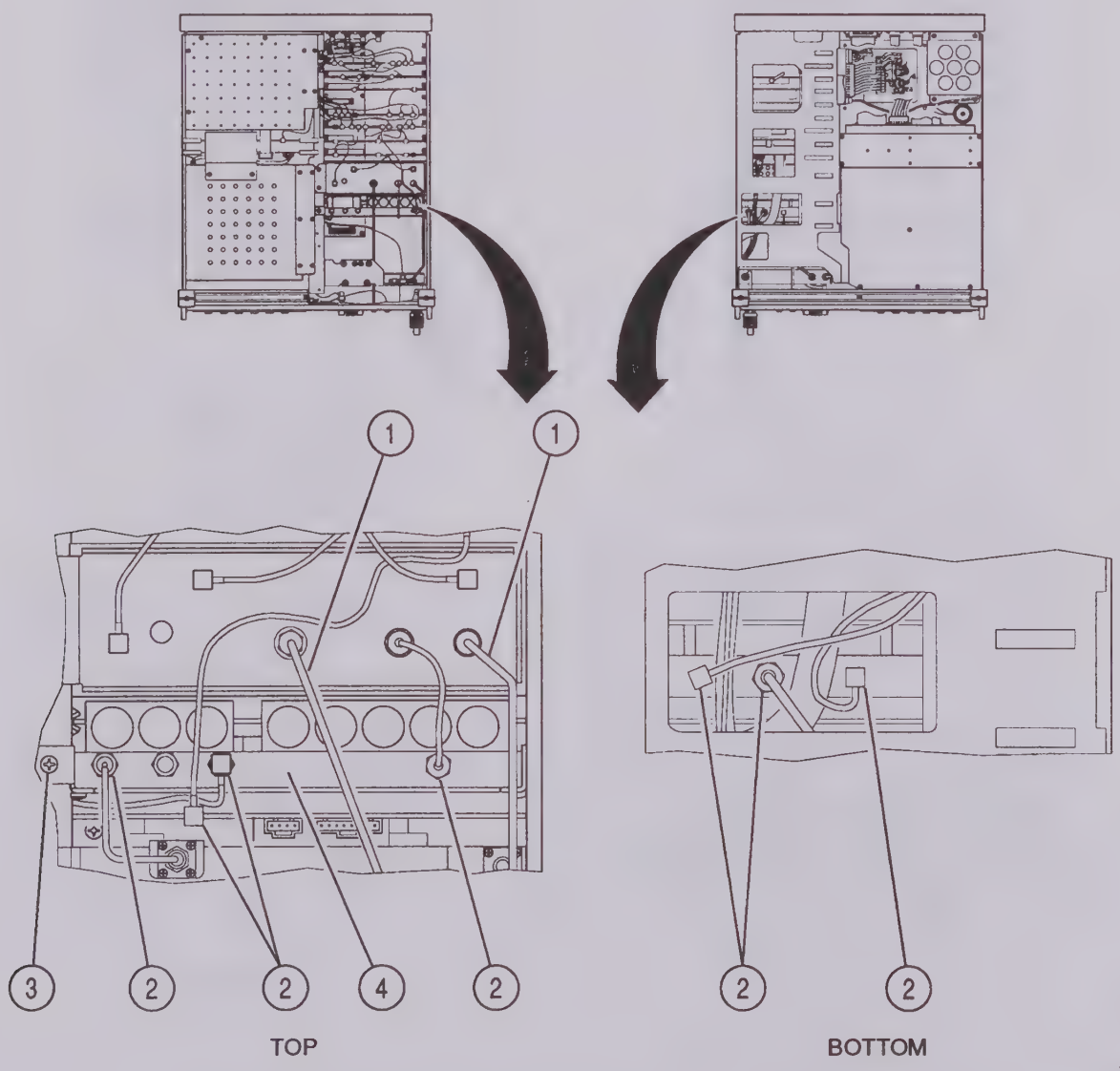
4-3-5 RF RECEIVER ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

AN930

STEP	PROCEDURE

1. Remove two coaxial cables (1).
2. Disconnect five or seven (with Option 02) coaxial cable connectors (2).
3. Remove three screws (3) (two right side, one top).
4. Remove RF Receiver Assembly (4).

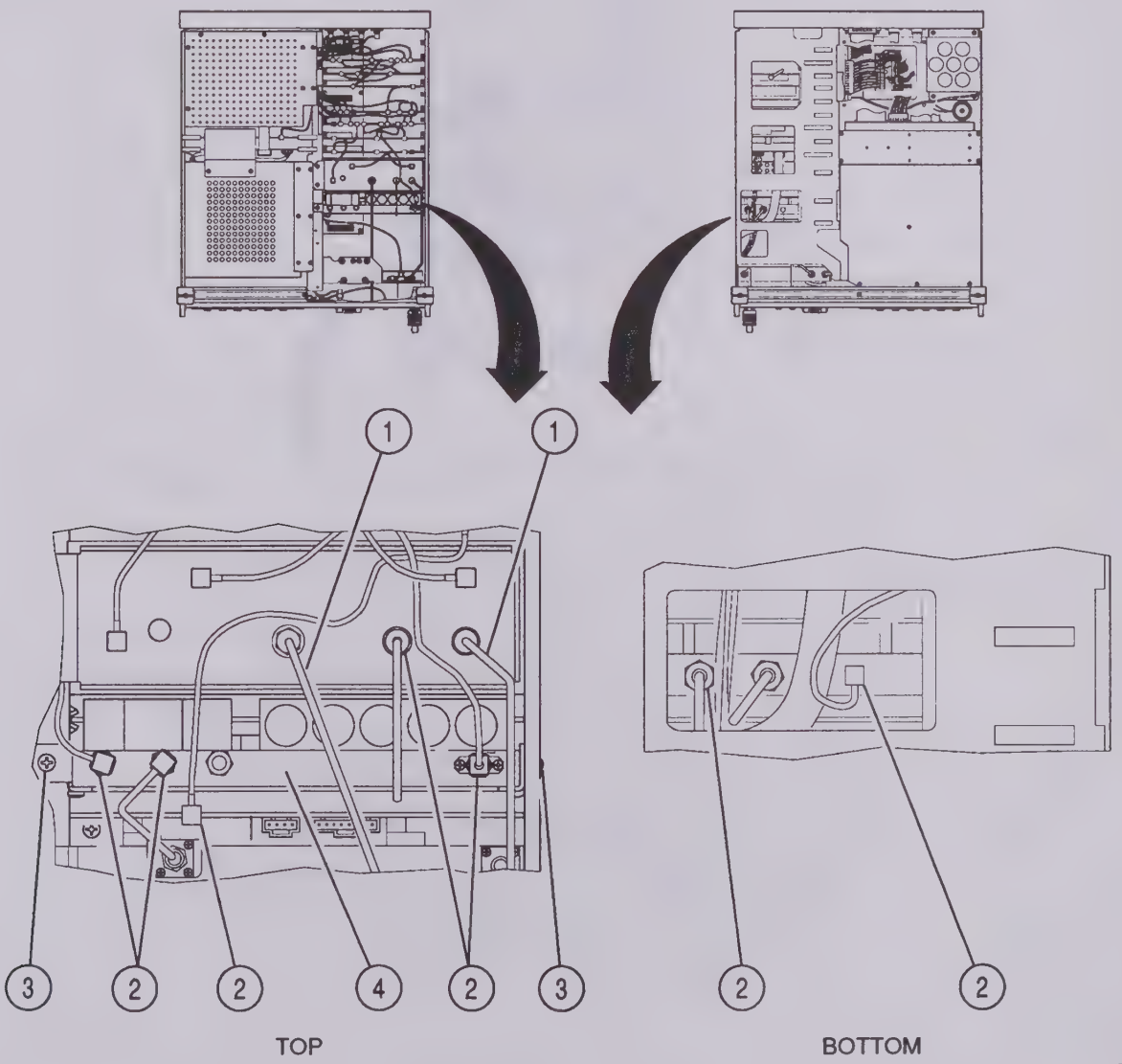


7221011

AN920, AN930A and AN940

STEP	PROCEDURE

1. Remove one (AN920) or two coaxial cables (1).
2. Disconnect five or seven (with Option 02) coaxial cable connectors (2).
3. Remove three screws (3) (two right side, one top).
4. Remove RF Receiver Assembly (4).



7221012

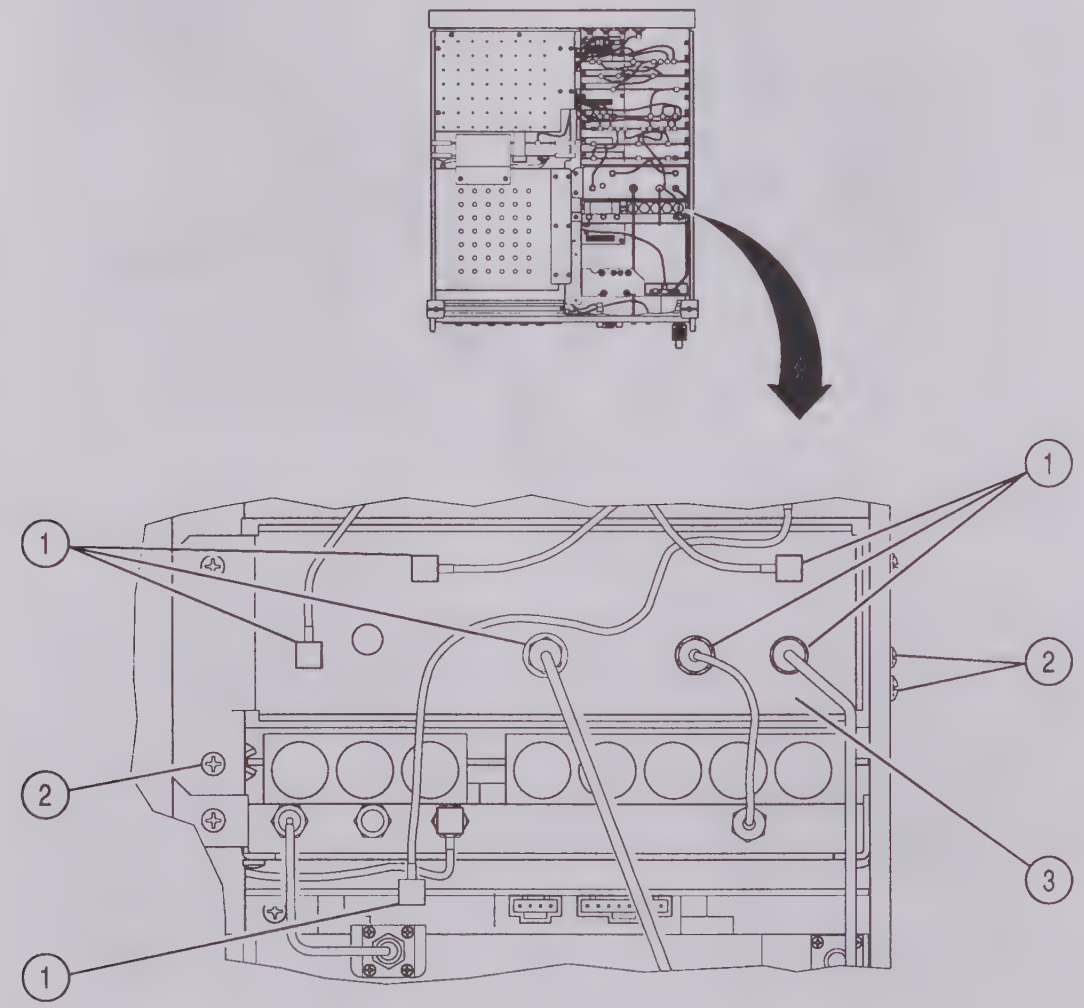
4-3-6 YIG SYNTHESIZER ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

AN930

STEP	PROCEDURE

1. Disconnect six or seven (with Option 02) coaxial cable connectors (1).
2. Remove five screws (2) (three right side, two top).
3. Remove YIG Synthesizer Assembly (3).

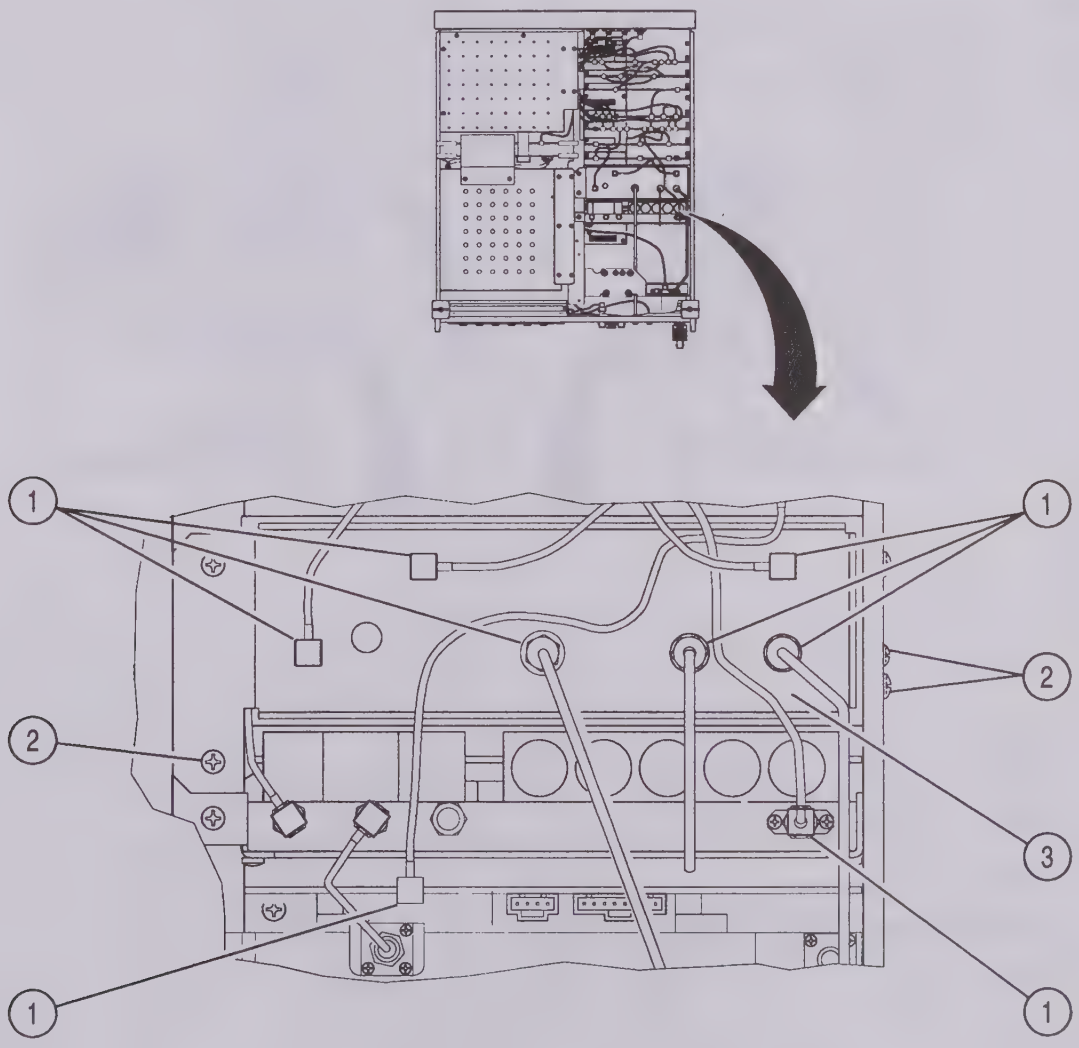


7221013

AN920, AN930A and AN940

STEP	PROCEDURE

1. Disconnect six (AN920), seven (AN920 with Option 02/AN930A, AN940 without Option 02) or eight (AN930A, AN940 with Option 02) coaxial cable connectors (1).
2. Remove five screws (2) (three right side, two top).
3. Remove YIG Synthesizer Assembly (3).



7221014

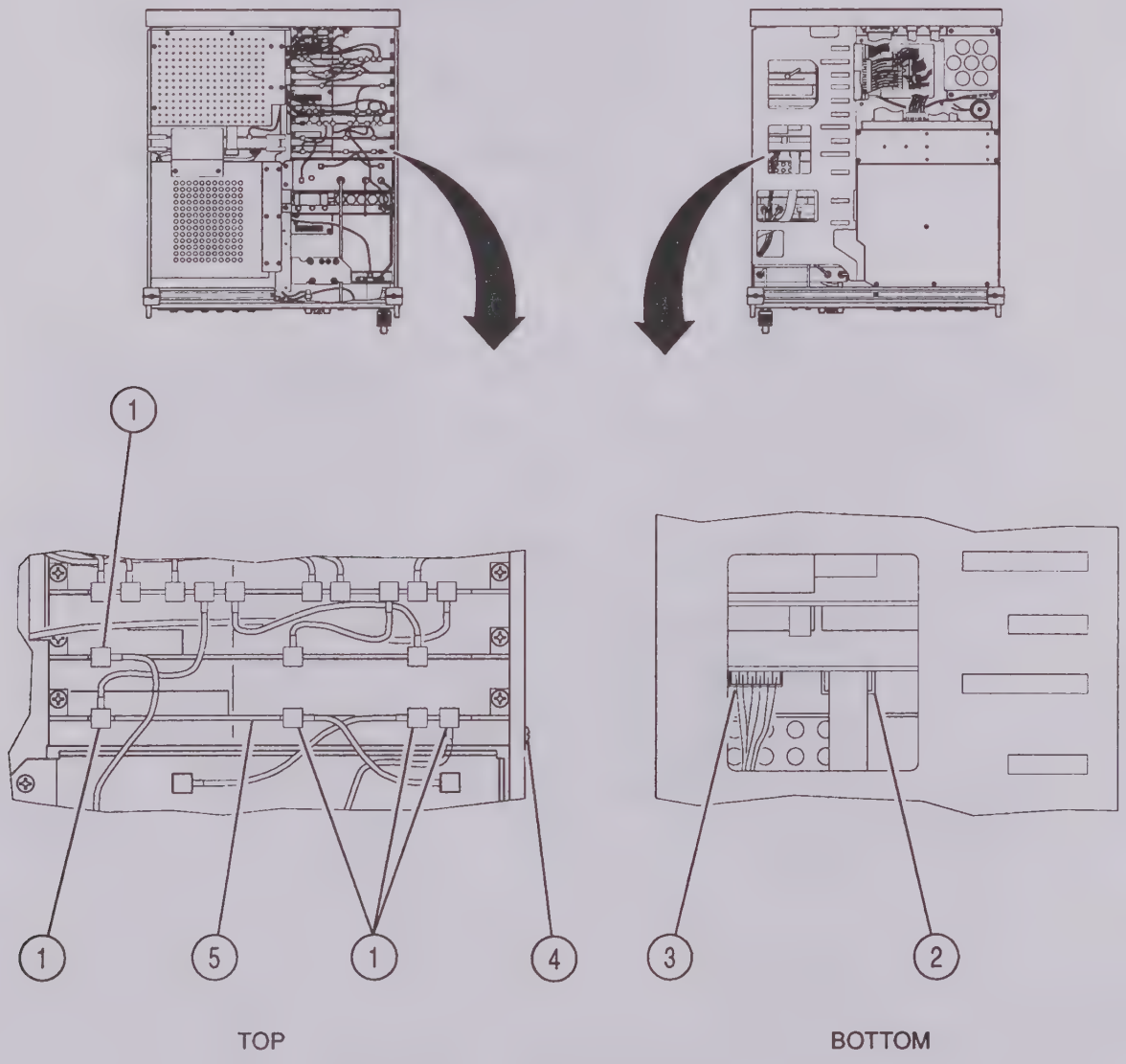
4-3-7 SWEEP SYNTHESIZER FIRMWARE ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

AN930

STEP	PROCEDURE

1. Disconnect four or five (with Option 02) coaxial cable connectors (1).
2. Disconnect ribbon cable connector (2) and wire cable connector (3).
3. Remove four screws (4) (two right side, two top).
4. Remove Sweep Synthesizer Firmware Assembly (5)

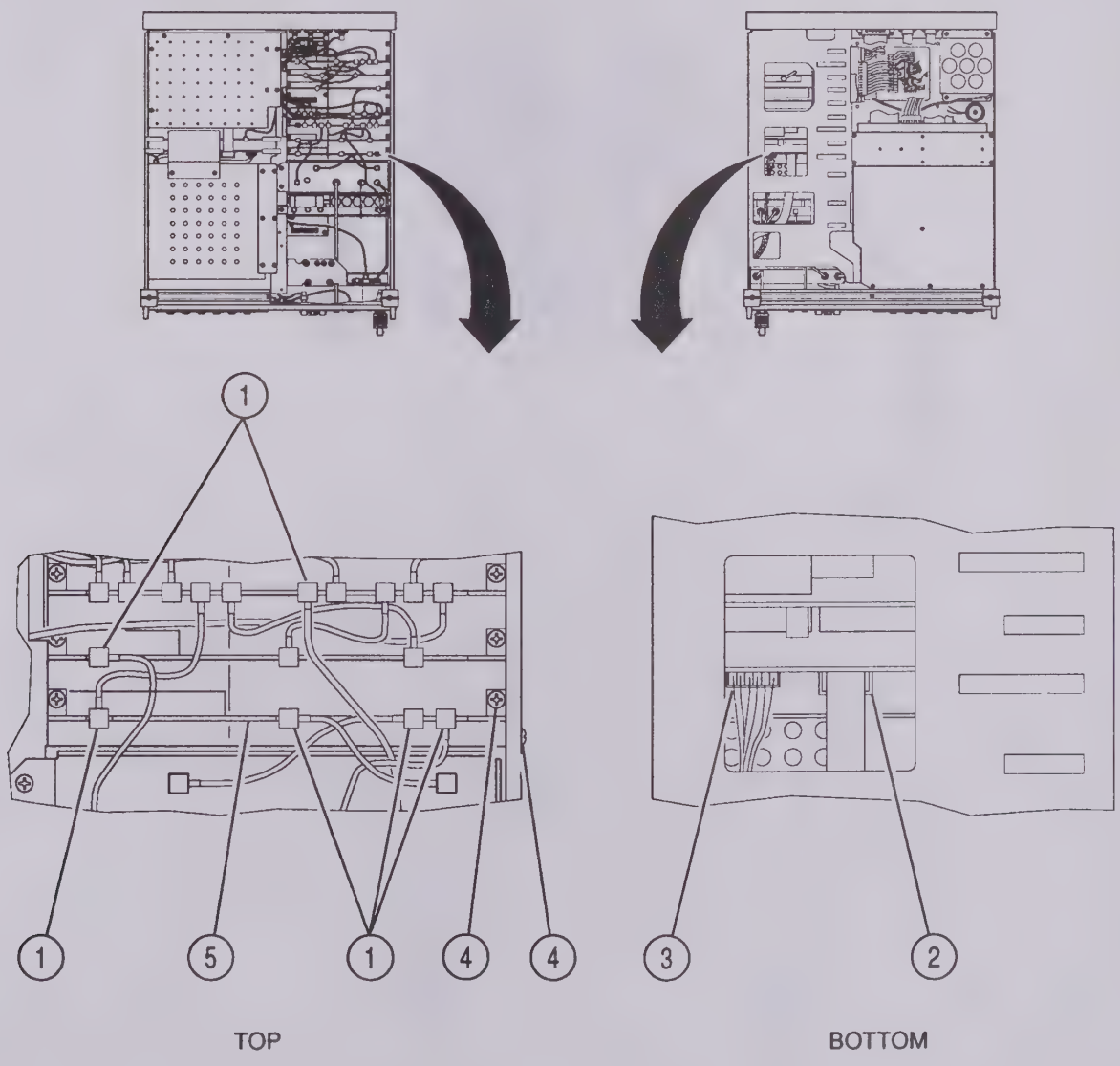


7221030

AN920, AN930A and AN940

STEP	PROCEDURE

1. Disconnect five or six (with Option 02) coaxial cable connectors (1).
2. Disconnect ribbon cable connector (2) and wire cable connector (3) (N/A for AN920).
3. Remove four screws (4) (two right side, two top).
4. Remove Sweep Synthesizer Firmware Assembly (5)



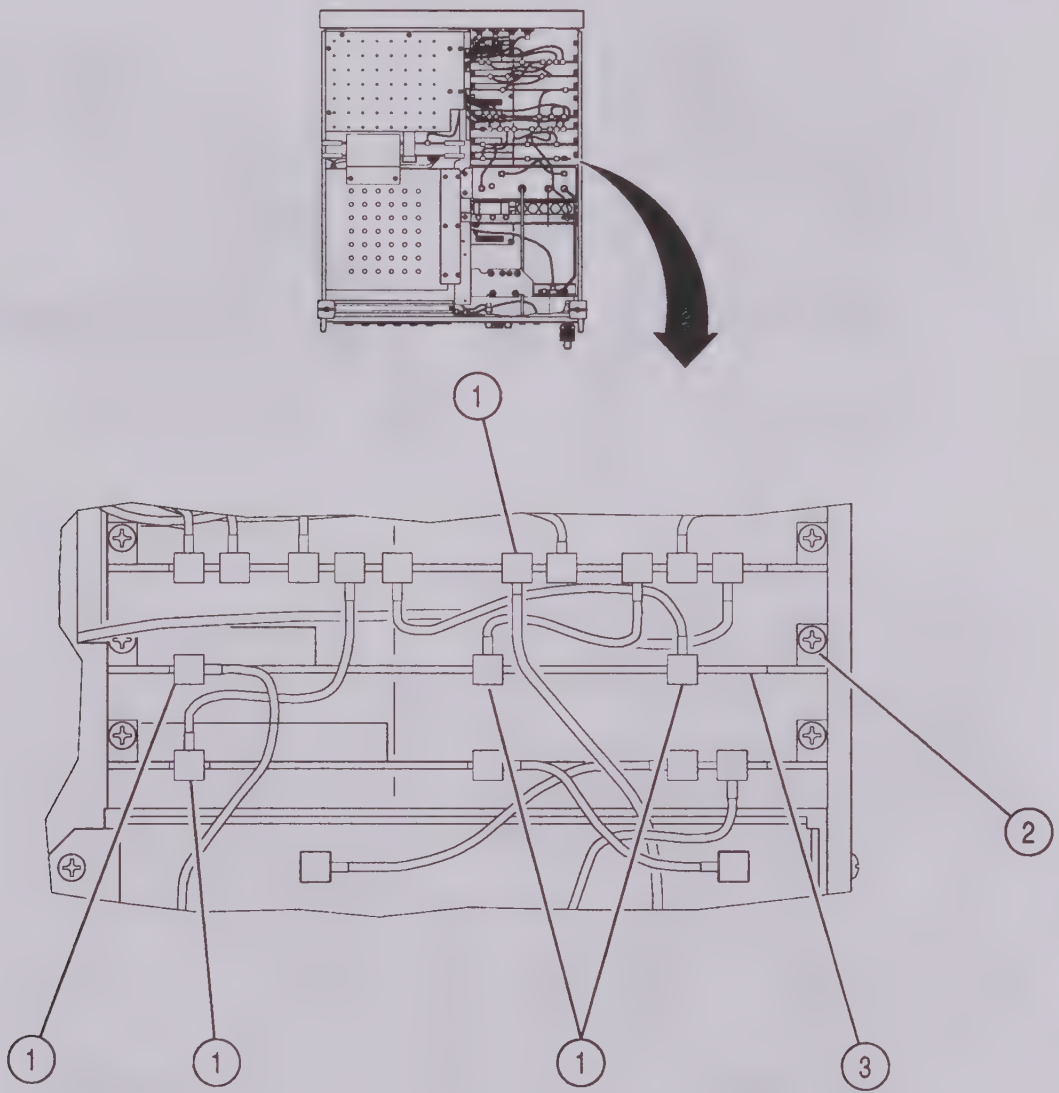
7221015

4-3-8 SAMPLER SYNTHESIZER FIRMWARE ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Disconnect four (AN930) or five coaxial cable connectors (1).
2. Remove two screws (2).
3. Remove Sampler Synthesizer Firmware Assemlby (3).



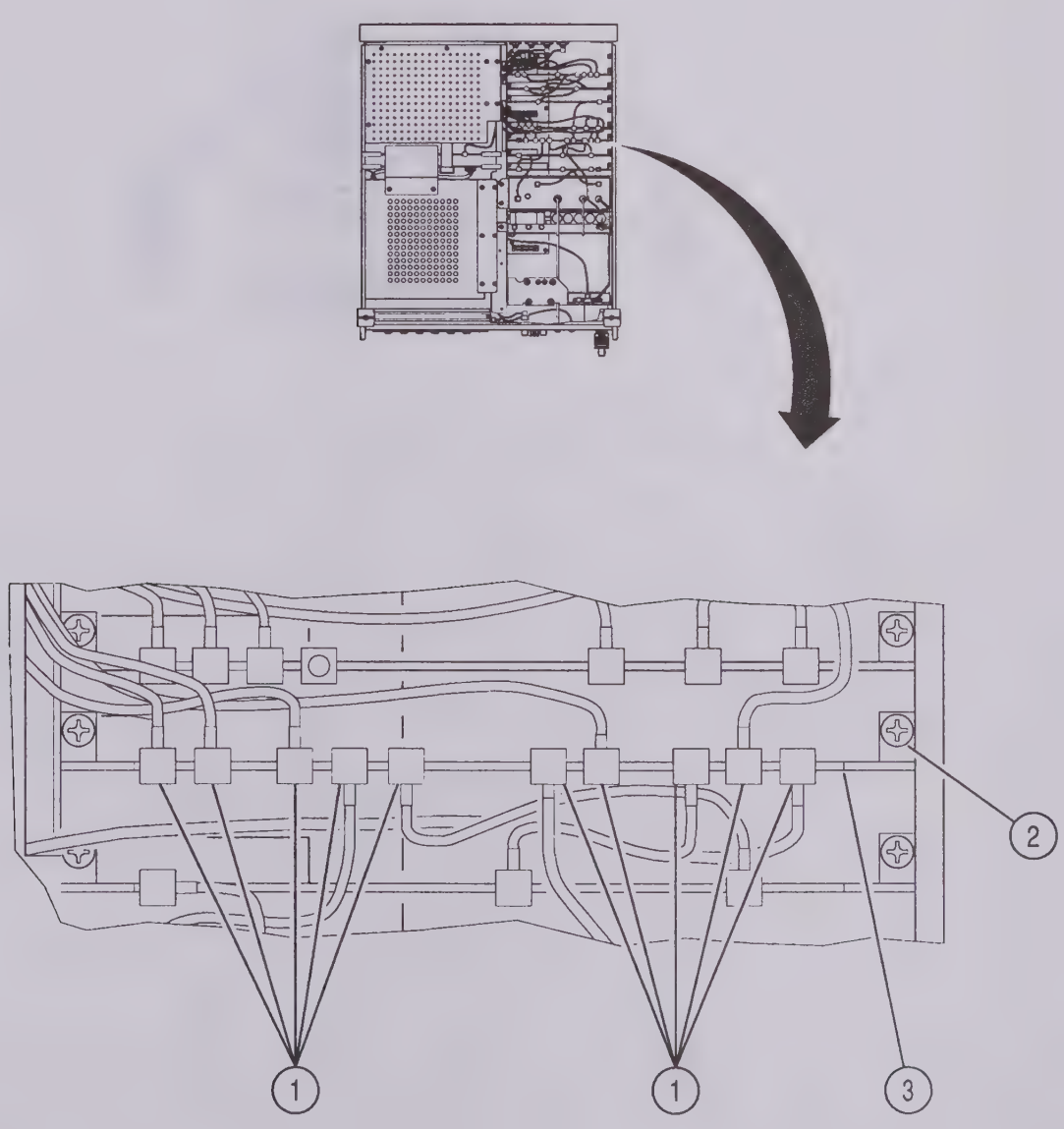
7221016

4-3-9 FREQUENCY REFERENCE FIRMWARE ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Disconnect nine or ten (with Medium or High Stability Time Base) coaxial cable connectors (1).
2. Remove two screws (2).
3. Remove Frequency Reference Firmware Assembly (3).



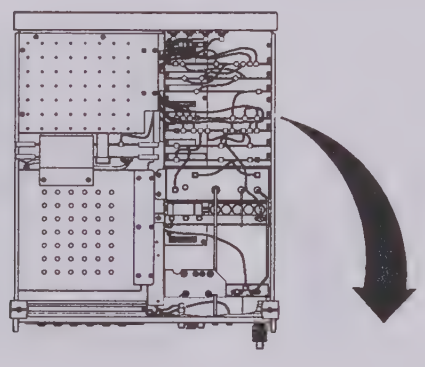
7221017

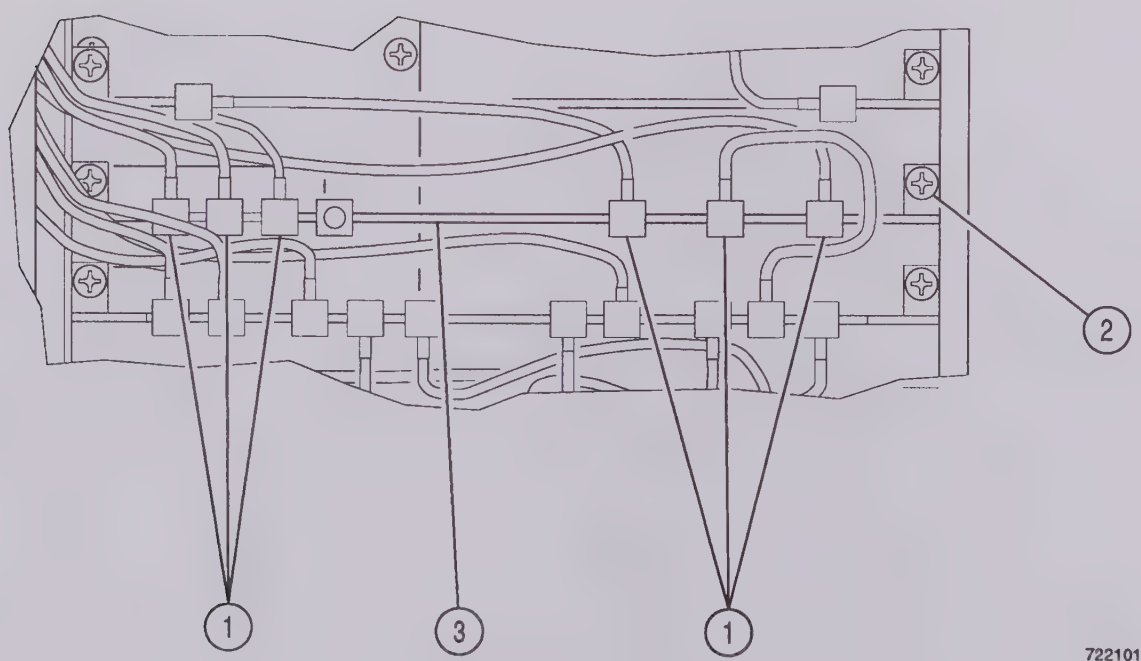
4-3-10 410 MHz IF FIRMWARE ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Disconnect five (AN920) or six coaxial cable connectors (1).
2. Remove two screws (2).
3. Remove 410 MHz IF Firmware Assembly (3).





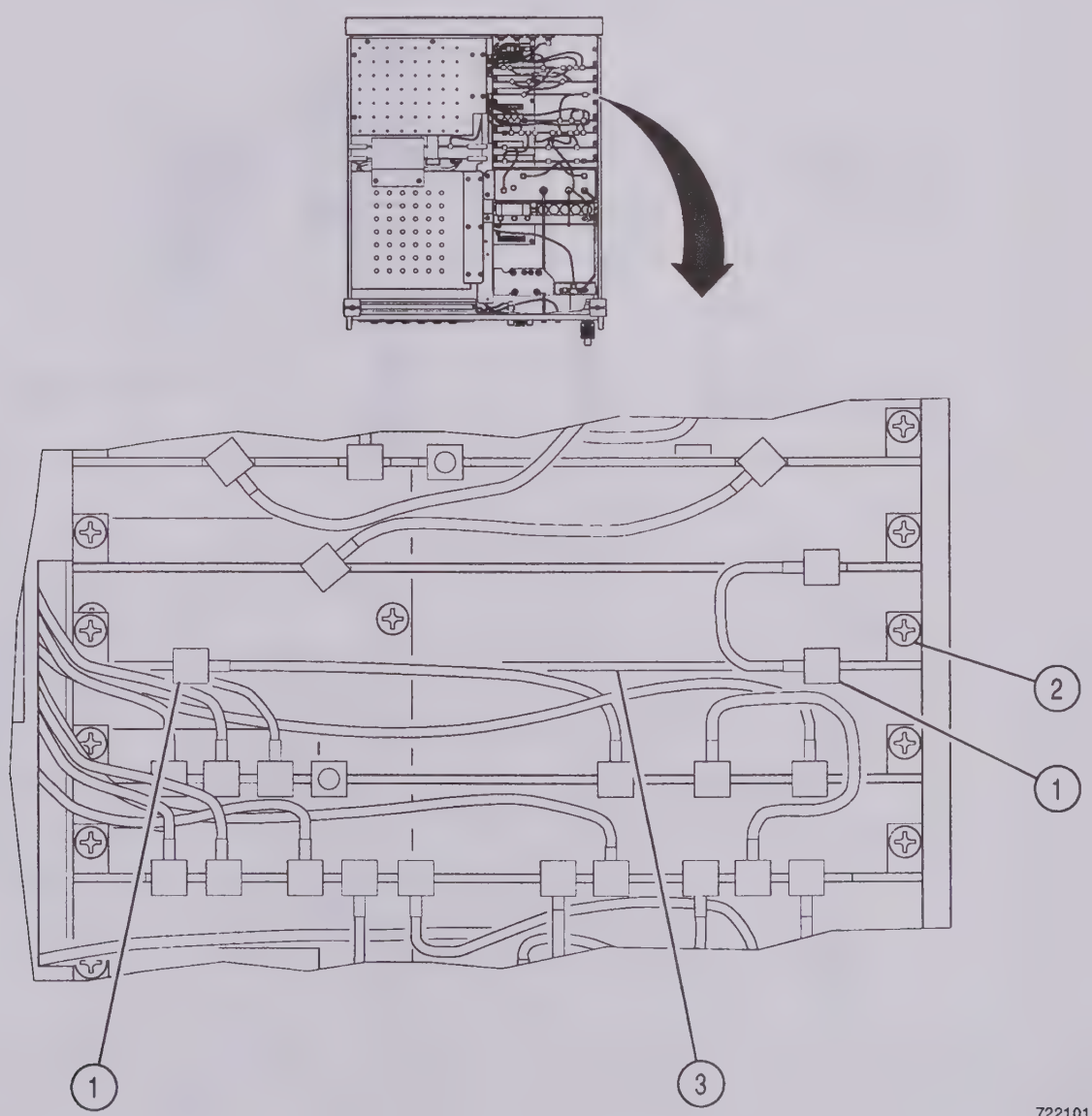
7221018

4-3-11 IF BANDWIDTH OPTION PC BOARD ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Disconnect two coaxial cable connectors (1).
2. Remove two screws (2).
3. Remove IF Bandwidth Option PC Board Assembly (3).



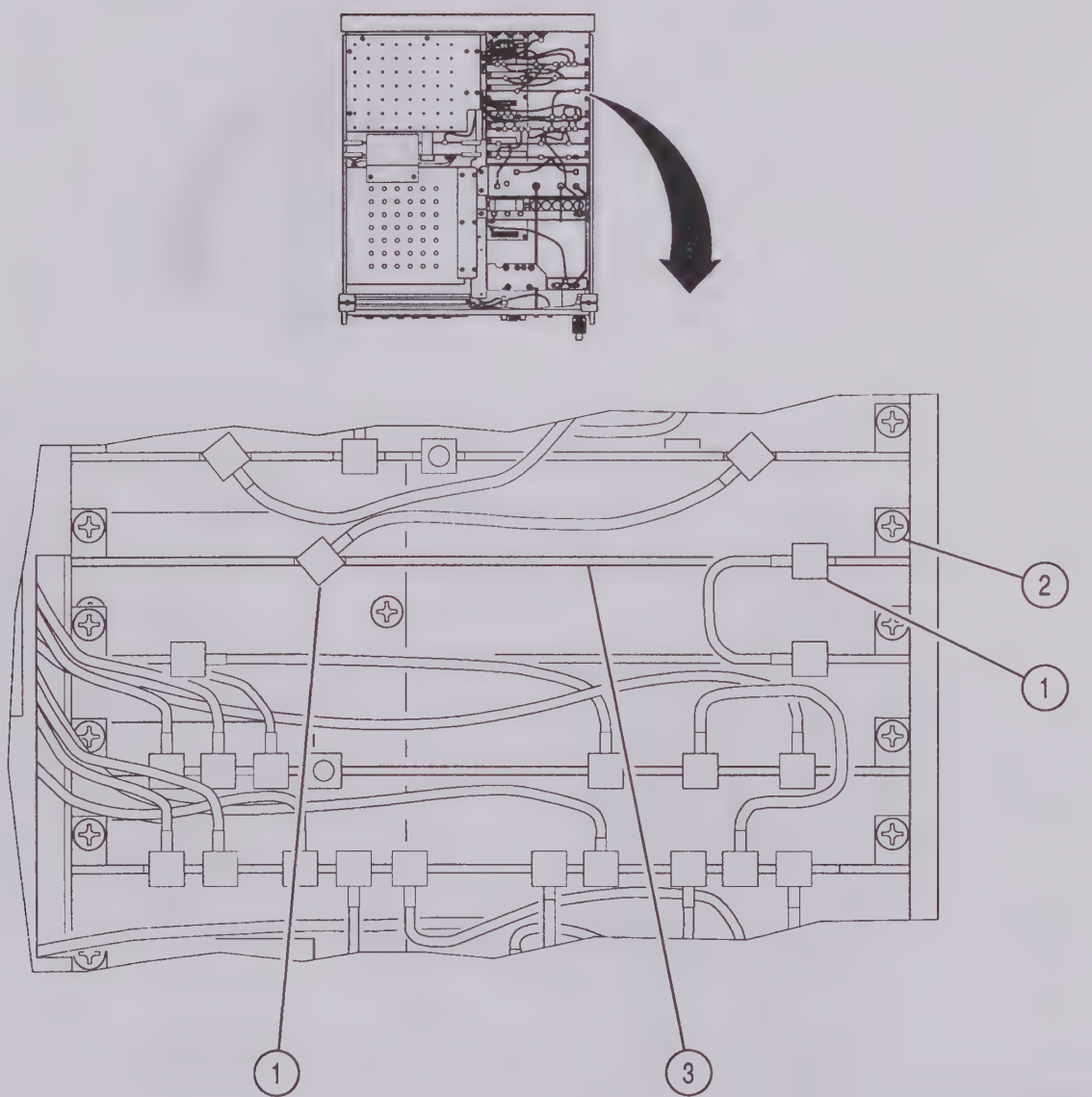
7221019

4-3-12 IF BANDWIDTH STANDARD PC BOARD ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Disconnect two coaxial cable connectors (1).
2. Remove two screws (2).
3. Remove IF BW Standard PC Board Assembly (3).

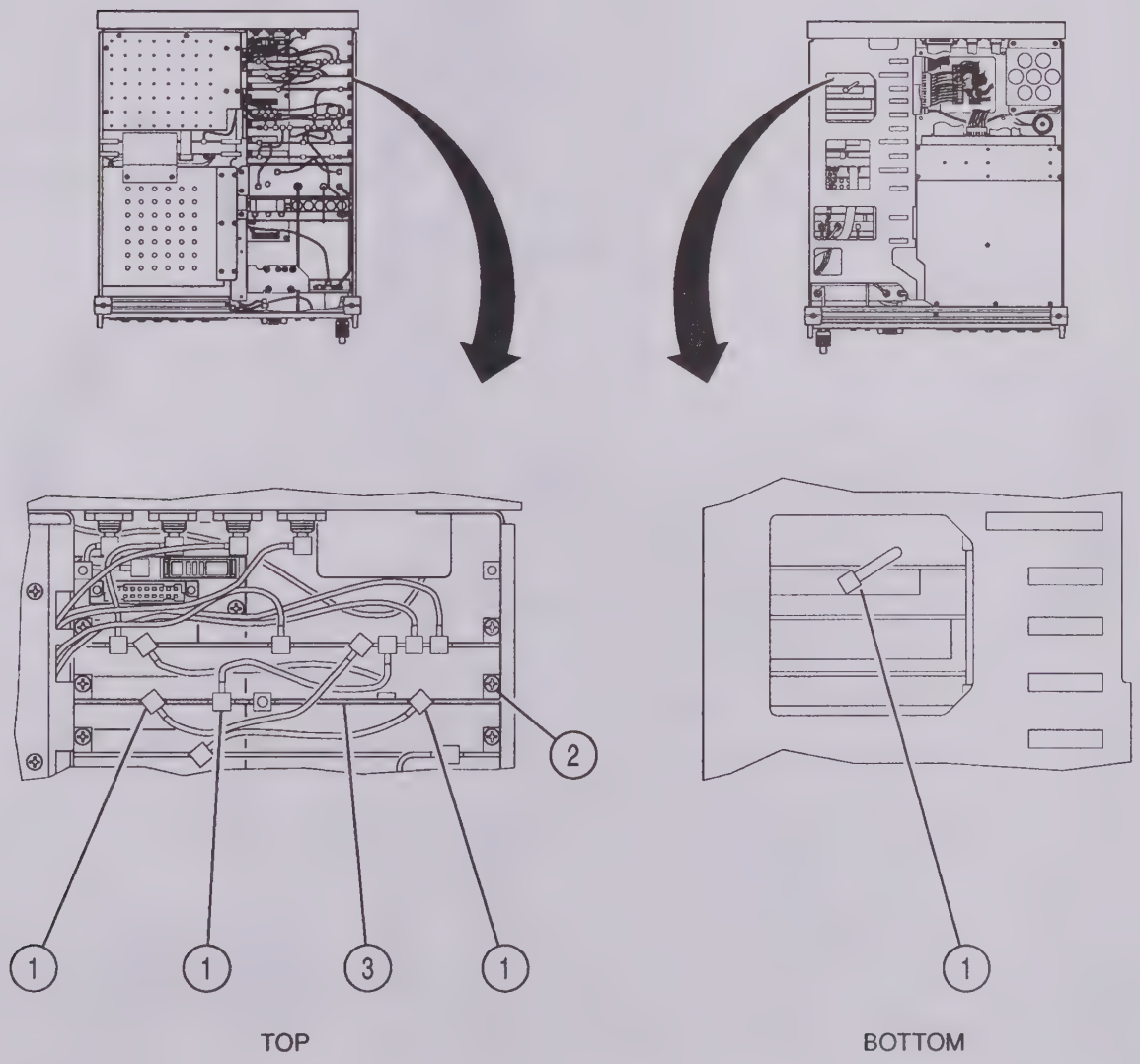


4-3-13 LOG AMP FIRMWARE ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP PROCEDURE

1. Disconnect four coaxial cable connectors (1).
2. Remove two screws (2).
3. Remove Log Amp Firmware Assembly (3).



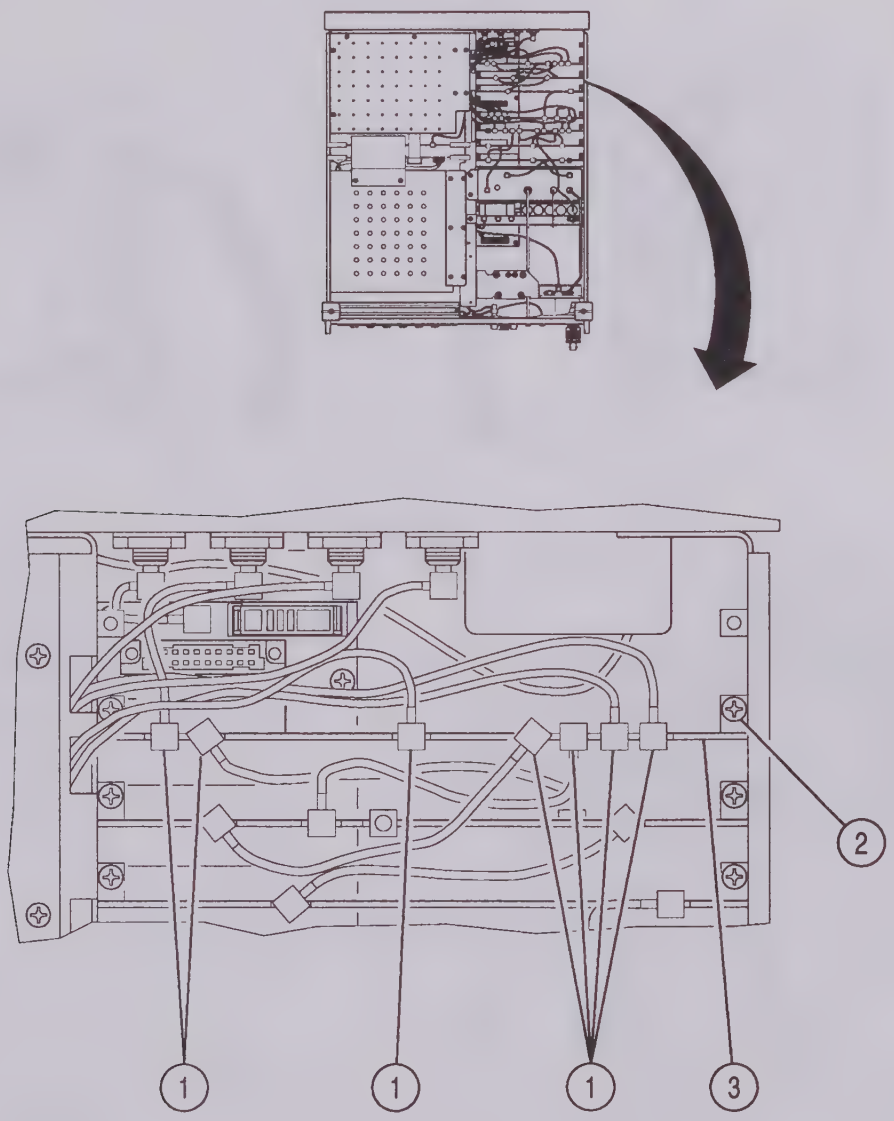
7221021

4-3-14 ANALOG FIRMWARE ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Disconnect seven coaxial cable connectors (1).
2. Remove two screws (2).
3. Remove Analog Firmware Assembly (3).



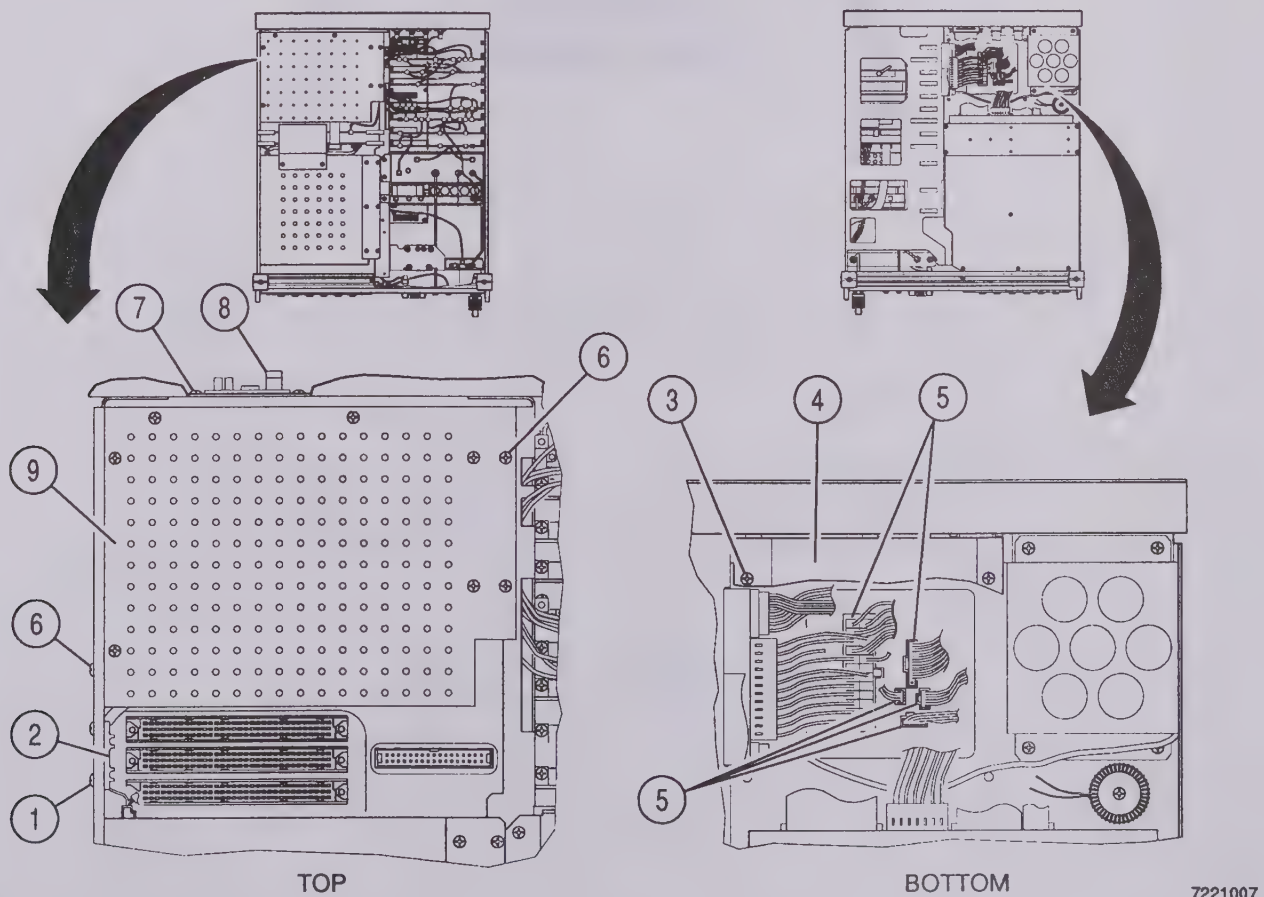
7221022

4-3-15 POWER SUPPLY ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).
Remove Digitizer Firmware Assembly (4-3-16).
Remove Video Controller Firmware Assembly (4-3-17).

STEP	PROCEDURE

1. Remove four screws (1) and card guide (2).
2. Remove four screws (3) and wire harness cover (4).
3. Disconnect four (without Medium or High Stability Time Base) or five wire cable connectors (5).
4. Remove four screws (6) (two left side, two top).
5. Remove four screws (7).
6. Remove EXT DC Fuse with cover (8).
7. Slide Power Supply Assembly (9) to front and lift up.



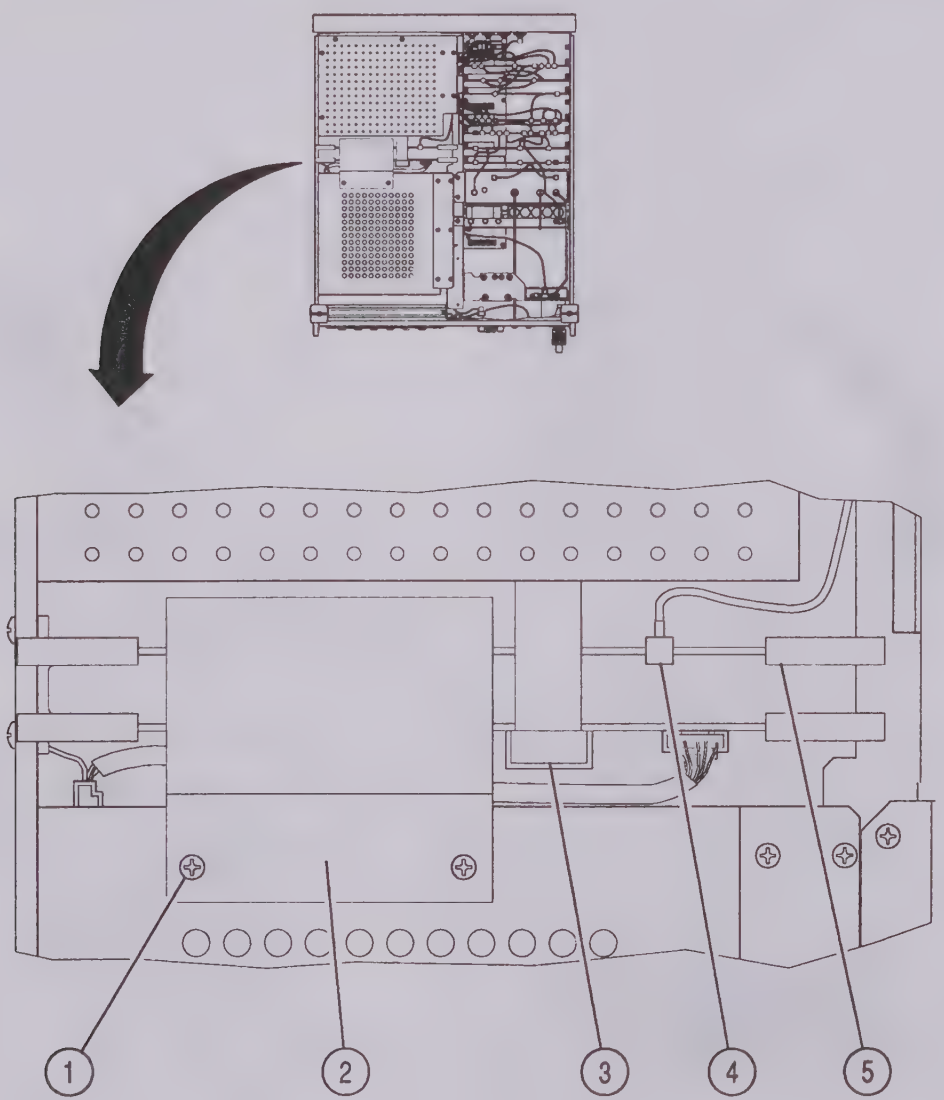
7221007

4-3-16 DIGITIZER FIRMWARE ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Remove two screws (1) and retainer bracket (2).
2. Disconnect ribbon cable connector (3).
3. Disconnect coaxial cable connector (4).
4. Raise card ejectors and remove Digitizer Firmware Assembly (5).



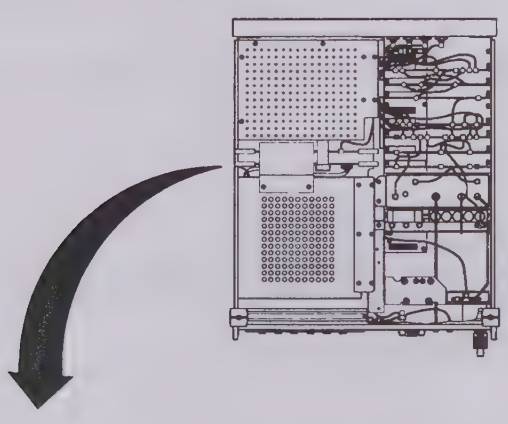
7221009

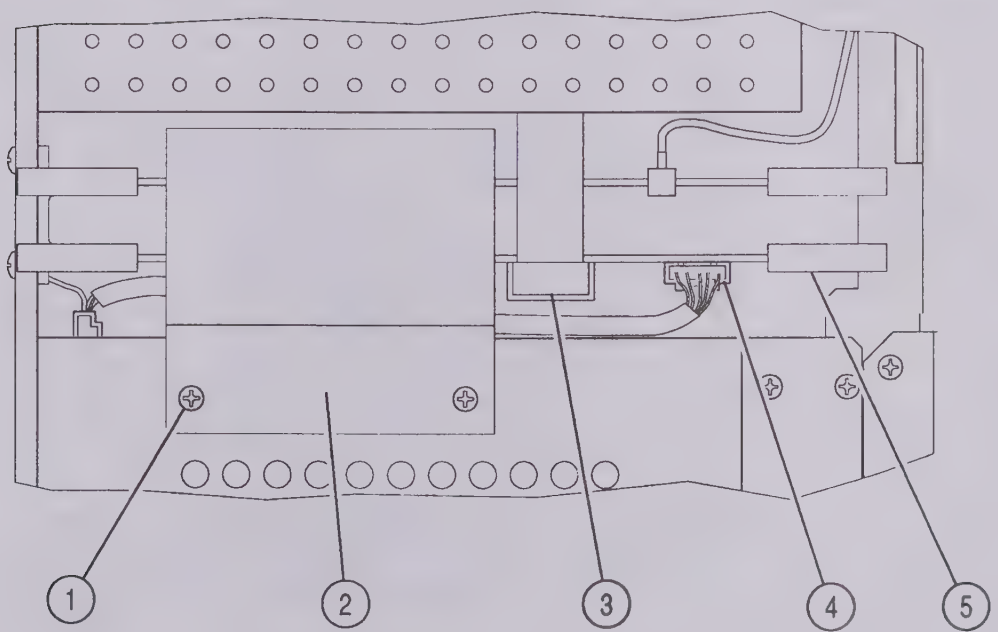
4-3-17 VIDEO CONTROLLER FIRMWARE ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Remove two screws (1) and retainer bracket (2).
2. Disconnect ribbon cable connector (3).
3. Disconnect wire cable connector (4).
4. Raise card ejectors and remove Video Controller Firmware Assembly (5).





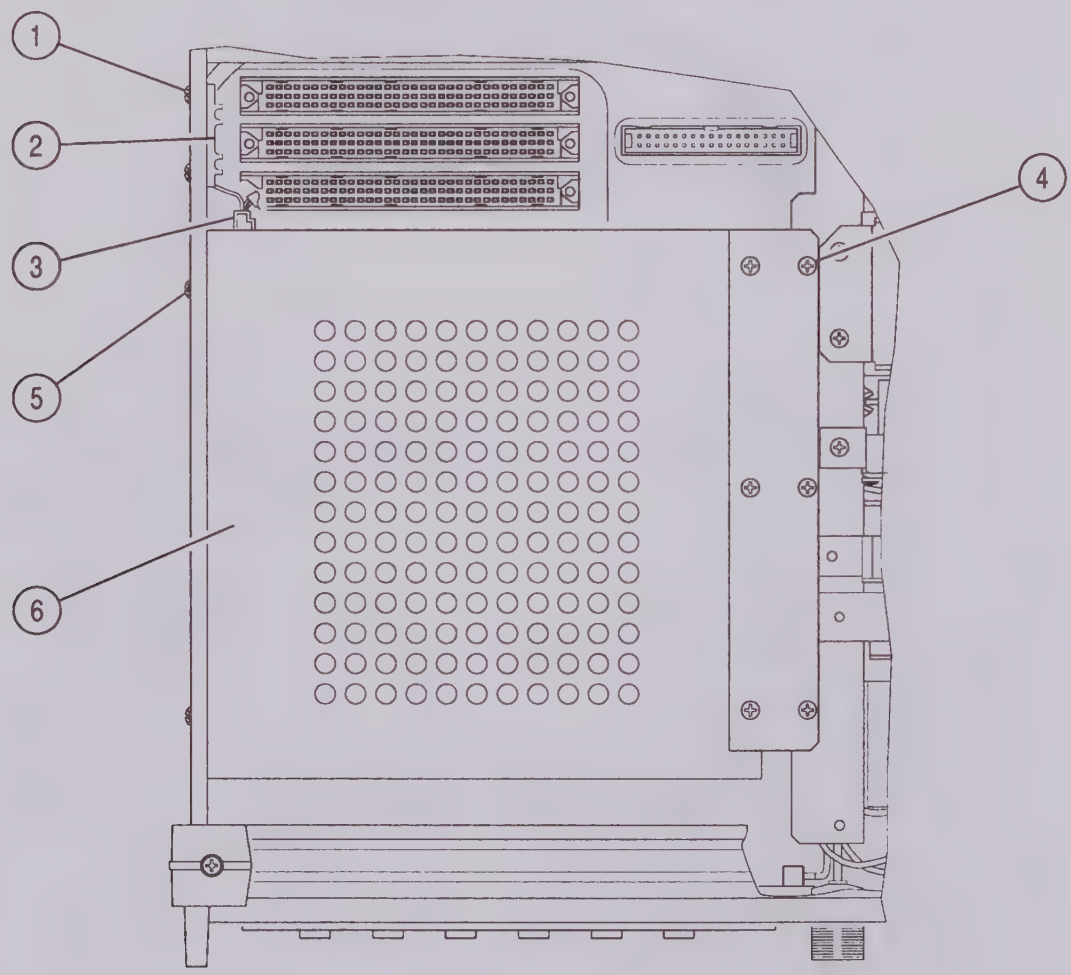
7221008

4-3-18 CRT ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).
Remove Digitizer Firmware Assembly (4-3-16).
Remove Video Controller Firmware Assembly (4-3-17).

STEP	PROCEDURE

1. Remove four screws (1) and card guide (2).
2. Disconnect wire cable connector (3).
3. Remove three screws (4).
4. Remove four screws (5).
5. Slide CRT Assembly (6) toward rear and lift up.



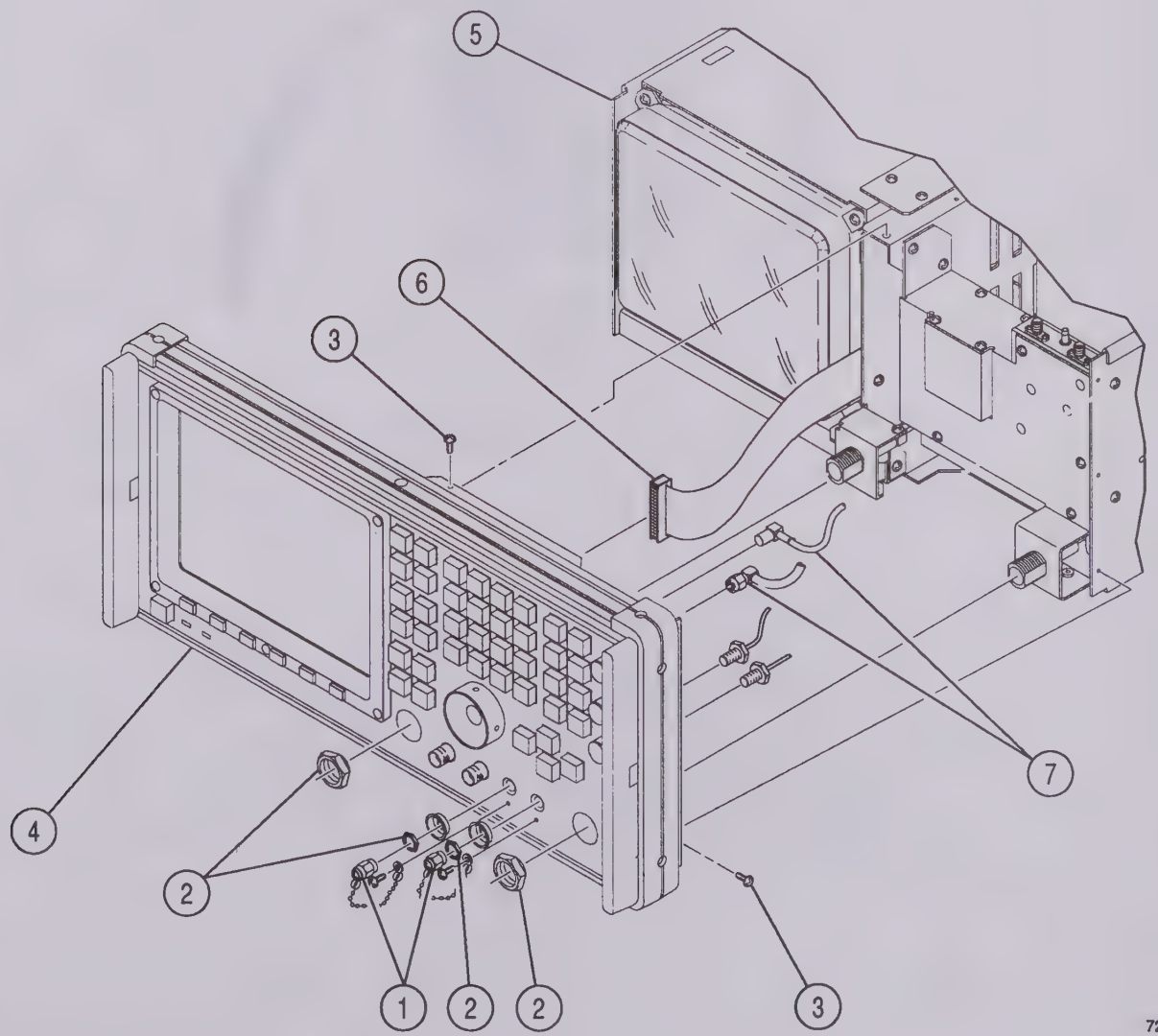
7221006

4-3-19 FRONT PANEL ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Remove two connector covers (1)
2. Remove two (AN930) or four nuts (2).
3. Remove nine screws (3) (three right side, two bottom, three left side, one top).
4. Lift Front Panel Assembly (4) off Chassis Assembly (5).
5. Disconnect ribbon cable connector (6).
6. Disconnect two coaxial cable connectors (7).



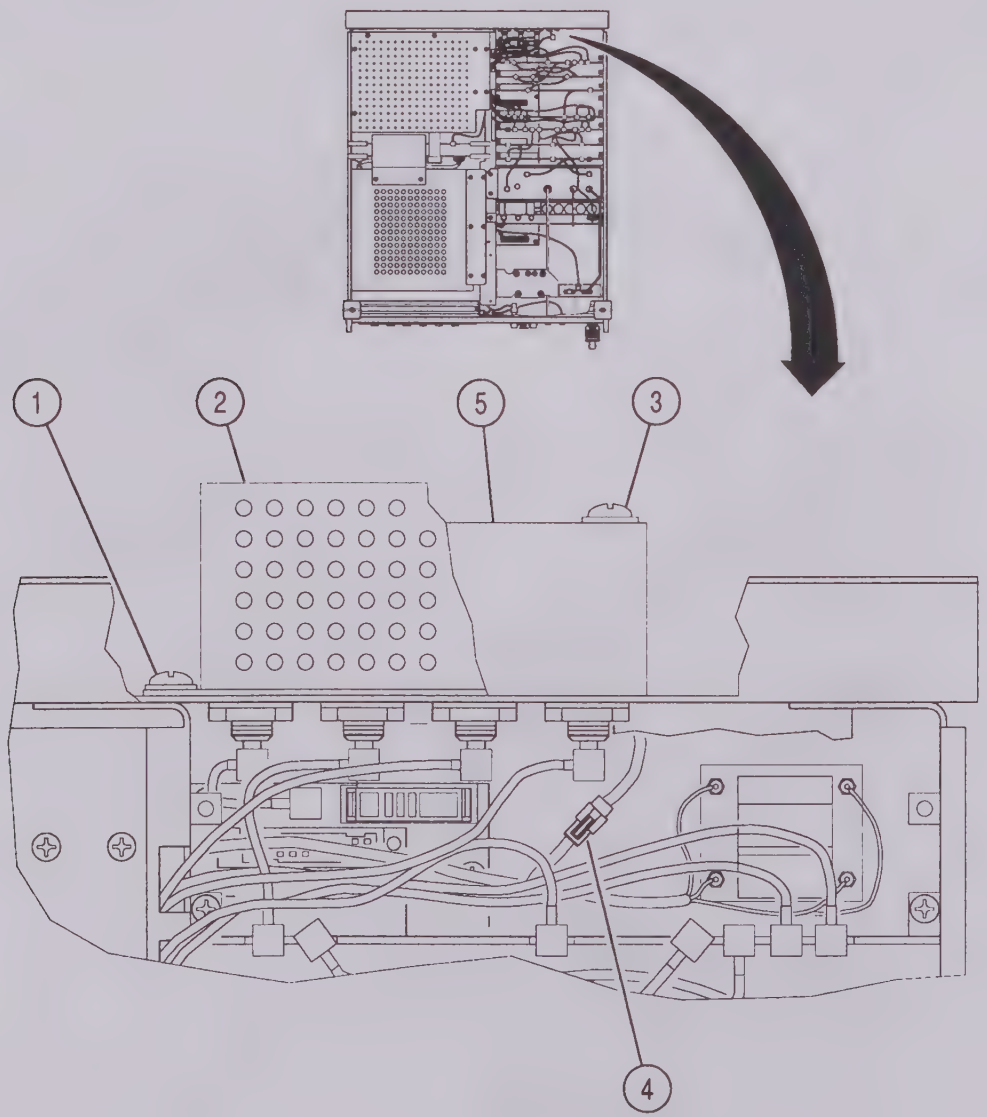
7221002

4-3-20 FAN ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Remove four screws and washers (1).
2. Remove bracket (2).
3. Remove three screws and washers (3).
4. Disconnect wire cable connector (4).
5. Remove Fan Assembly (5).



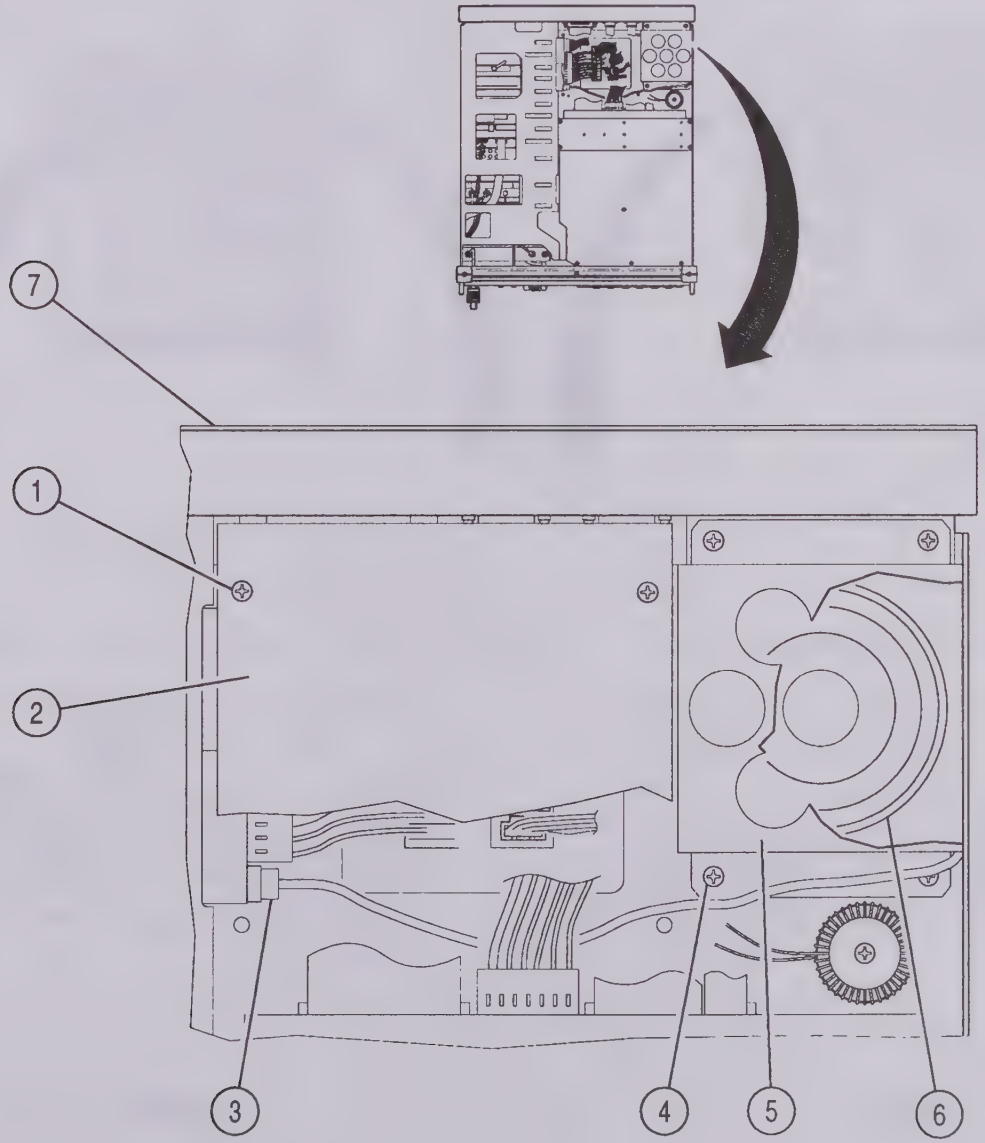
7221024

4-3-21 INTERNAL AUDIO SPEAKER

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Remove four screws (1) and wire harness cover (2).
2. Disconnect wire cable connector (3).
3. Remove four screws (4) and bracket (5).
4. Remove internal audio speaker (6), carefully routing wire cable out of Chassis Assembly (7).



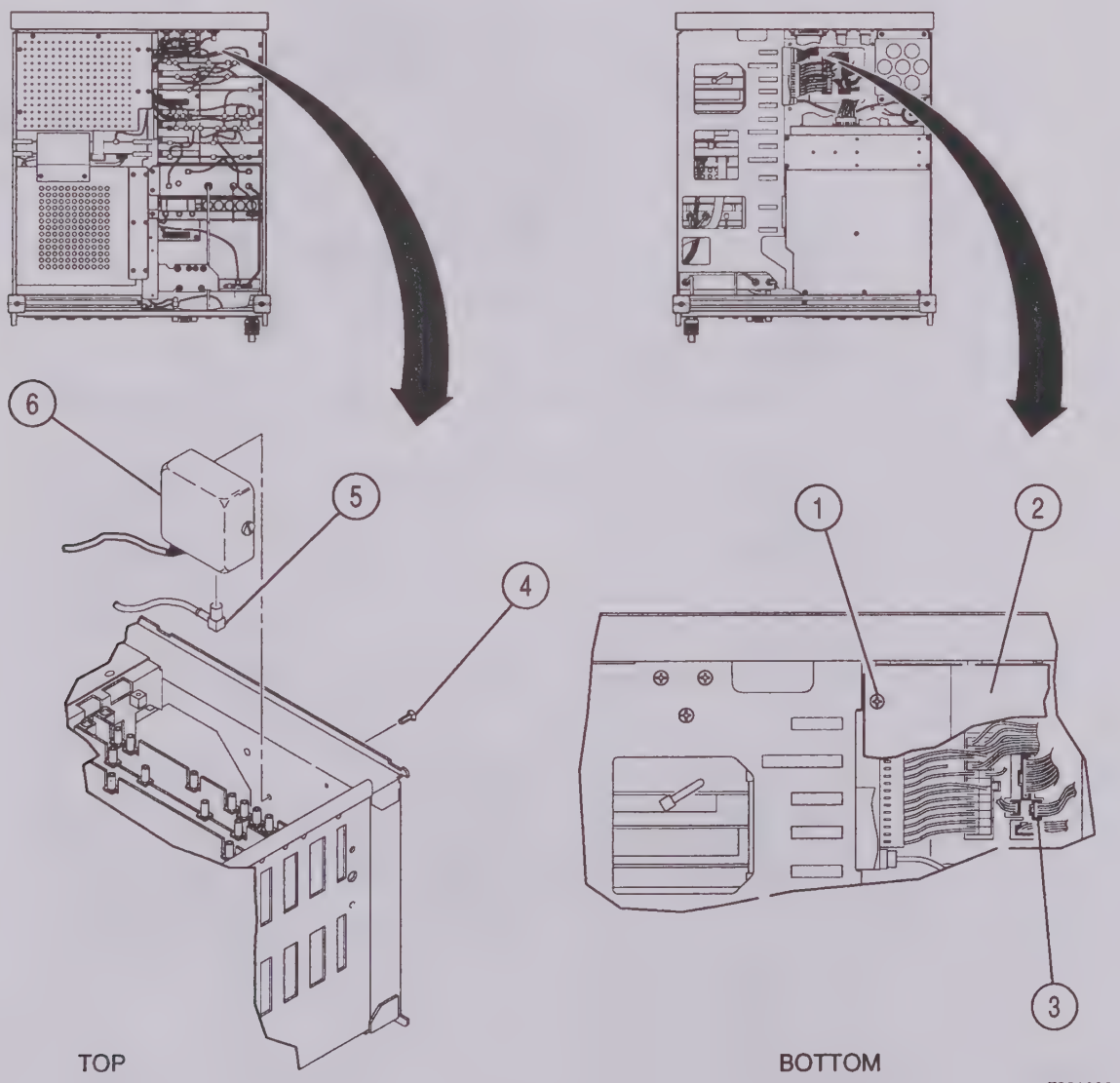
7221023

4-3-22 HIGH STABILITY TIME BASE (OPTION 09)

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP PROCEDURE

1. Remove four screws (1) and wire harness cover (2).
2. Disconnect wire cable connector (3).
3. Remove two screws (4).
4. Disconnect coaxial cable connector (5).
5. Remove High Stability Time Base (6).

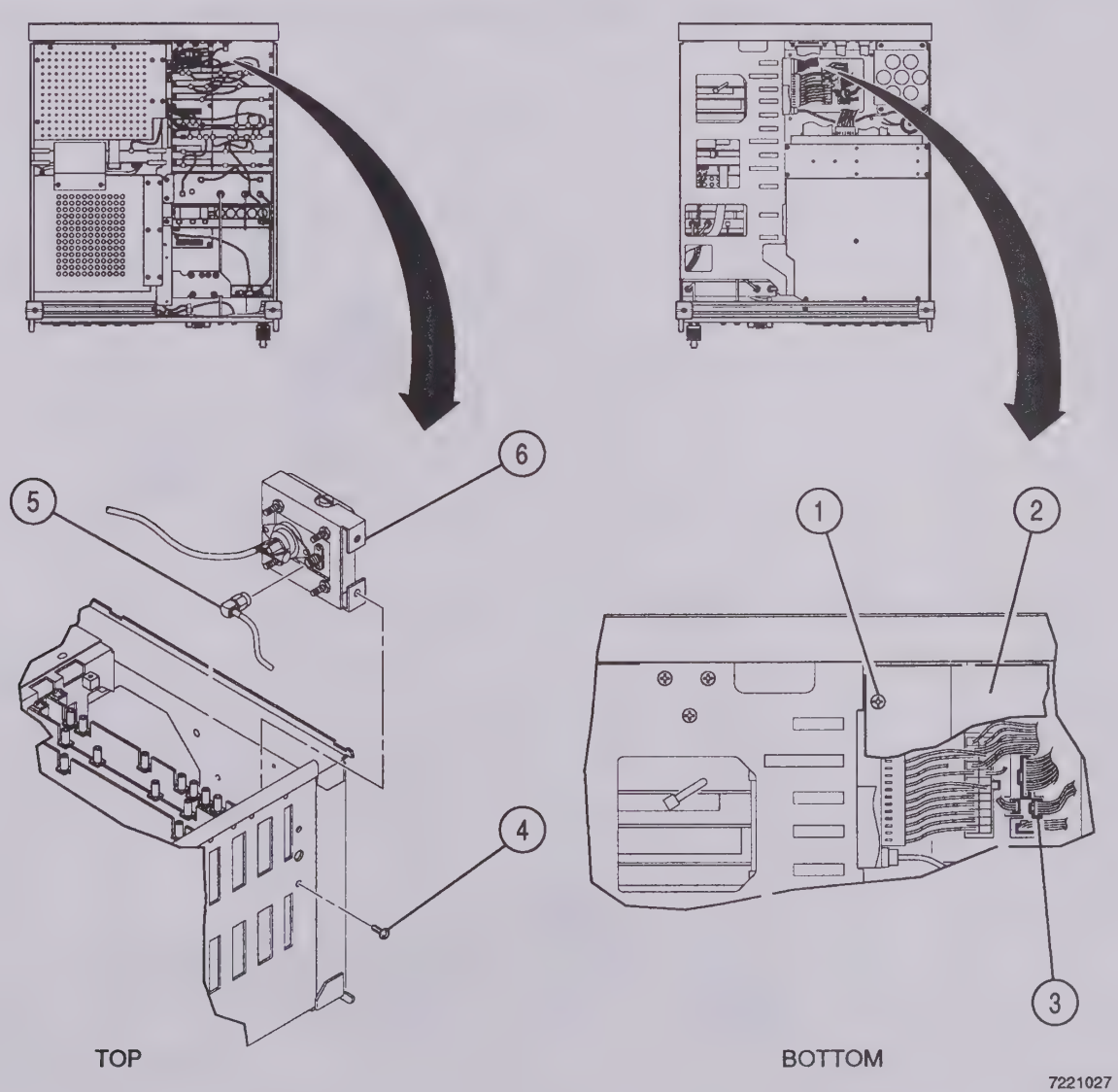


4-3-23 MEDIUM STABILITY TIME BASE

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).

STEP	PROCEDURE

1. Remove four screws (1) and wire harness cover (2).
2. Disconnect wire cable connector (3).
3. Remove two screws (4).
4. Disconnect coaxial cable connector (5).
5. Remove Medium Stability Time Base (6).

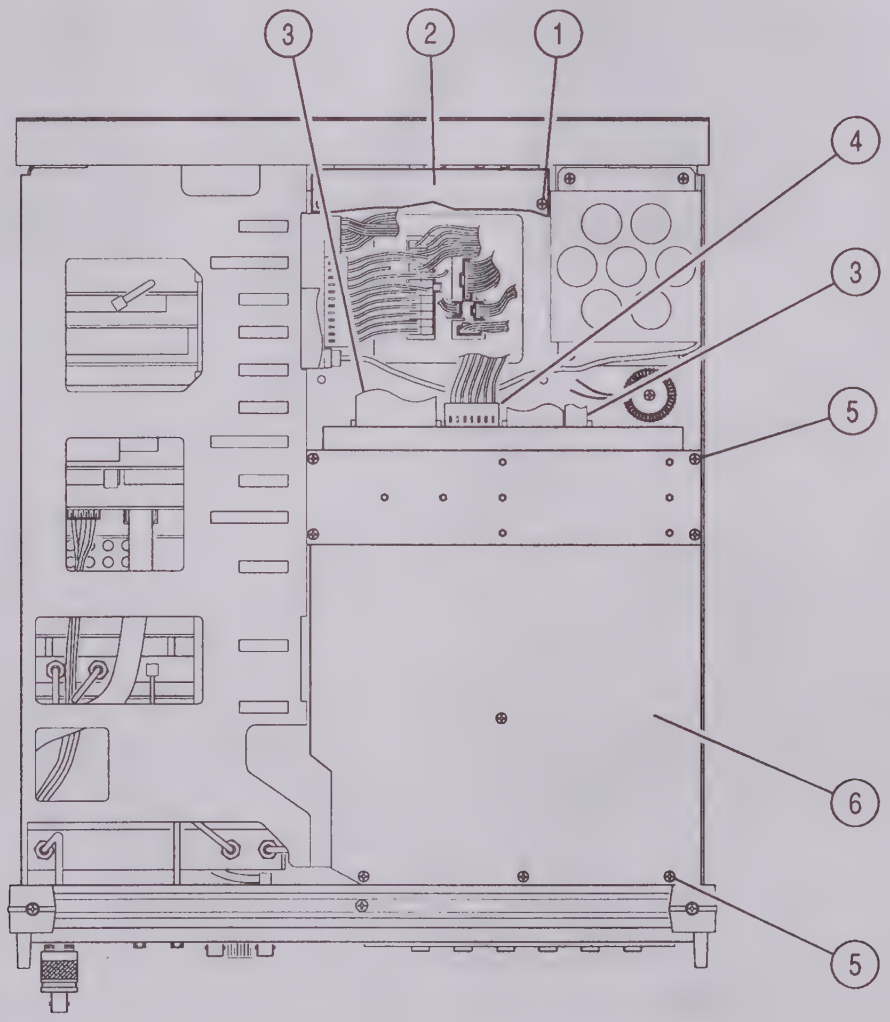


4-3-24 SYSTEM CONTROLLER FIRMWARE ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).
Remove Digitizer Firmware Assembly (4-3-16).
Remove Video Controller Firmware Assembly (4-3-17).

STEP	PROCEDURE

1. Remove four screws (1) and wire harness cover (2).
2. Disconnect two ribbon cable connectors (3).
3. Disconnect wire cable connector (4).
4. Remove eight screws (5).
5. Remove System Controller Firmware Assembly (6), carefully toward rear to avoid damage to center front corner.



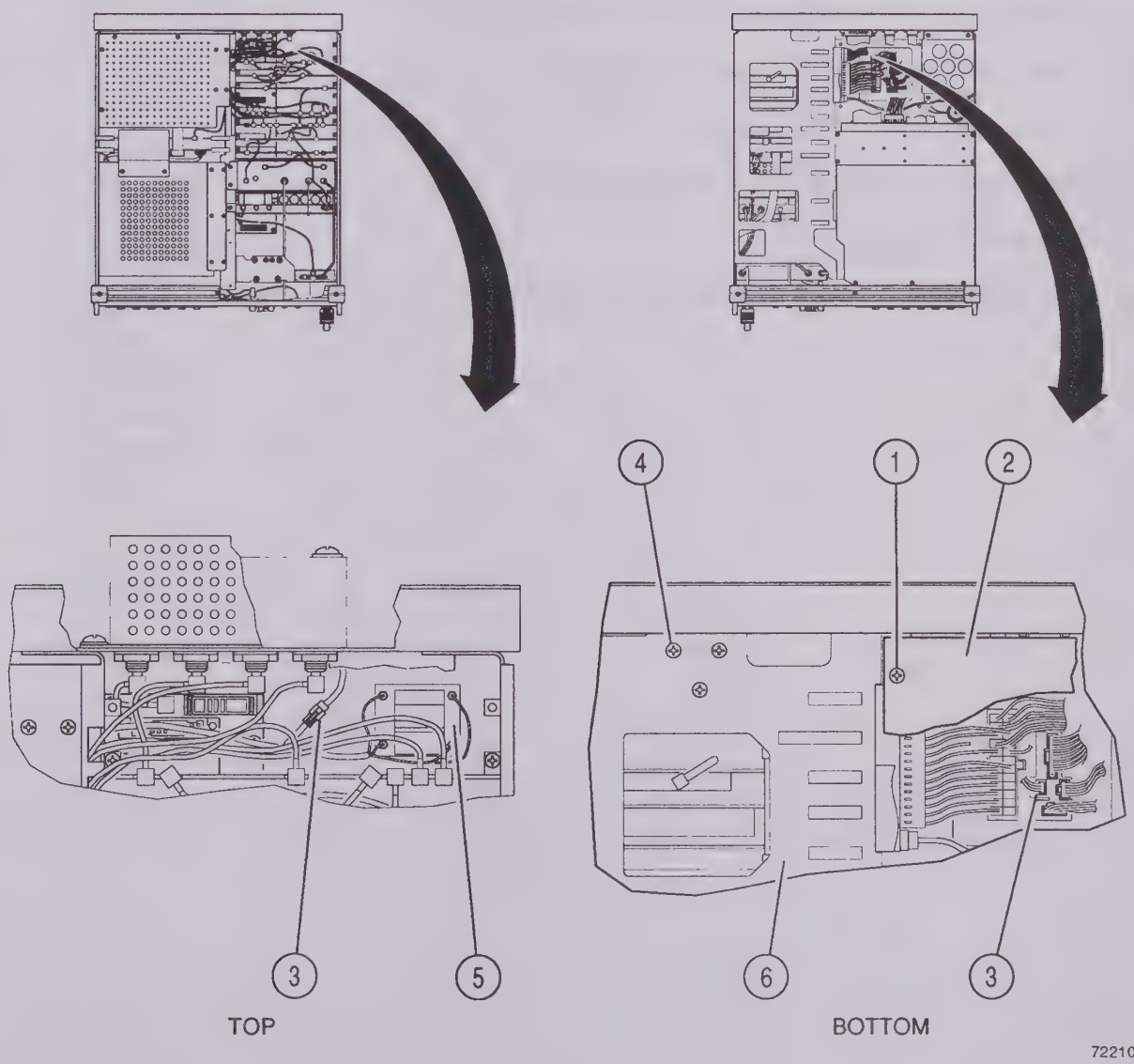
7221010

4-3-25 FAN FILTER ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).
Remove High Stability Time Base (4-3-22) or
Remove Medium Stability Time Base (4-3-23).

STEP	PROCEDURE

1. Remove four screws (1) and wire harness cover (2).
2. Disconnect two wire cable connectors (3).
3. Remove three screws (4)
4. Remove Fan Filter Assembly (5), carefully routing wire cable out of Chassis Assembly (6).



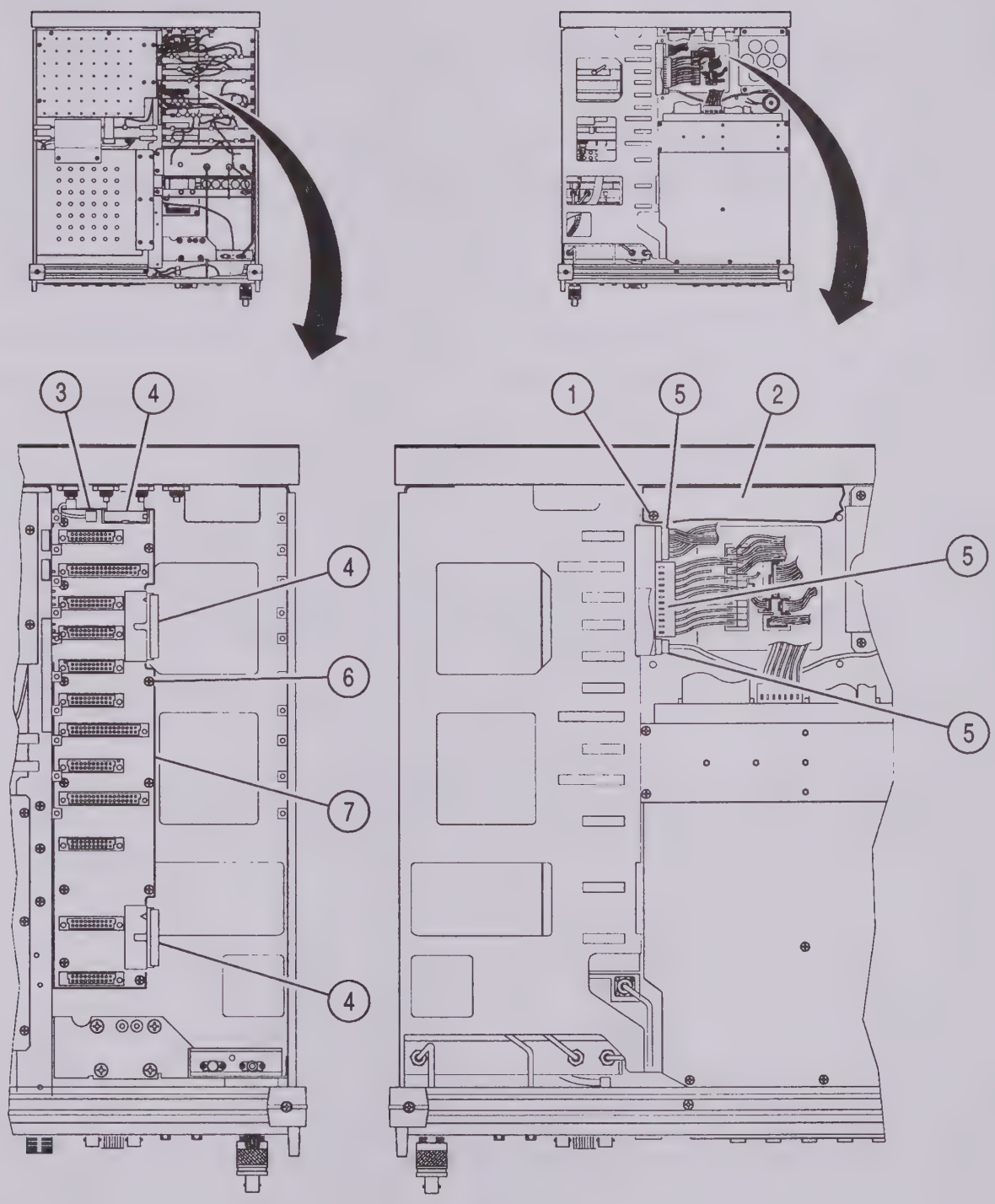
7221025

4-3-26 MOTHERBOARD PC BOARD ASSEMBLY

PRELIMINARY PROCEDURES: Remove Case Assembly (4-3-1).
Remove RF Receiver Assembly (4-3-5).
Remove YIG Synthesizer Assembly (4-3-6).
Remove Sweep Synthesizer Firmware Assembly (4-3-7).
Remove Sampler Synthesizer Firmware Assembly (4-3-8).
Remove Frequency Reference Firmware Assembly (4-3-9).
Remove 410 MHz Firmware Assembly (4-3-10).
Remove IF Bandwidth Option PC Board Assembly (4-3-11).
Remove IF Bandwidth Standard PC Board Assembly (4-3-12).
Remove Log Amp Firmware Assembly (4-3-13).
Remove Analog Firmware Assembly (4-3-14).

STEP	PROCEDURE

1. Remove four screws (1) and wire harness cover (2).
2. Disconnect coaxial cable connector (3).
3. Disconnect three ribbon cable connectors (4).
4. Disconnect three wire cable connectors (5).
5. Remove 11 screws (6)
6. Remove Motherboard PC Board Assembly (7).


3
4
4
6
7
4
1
5
2
5
5
TOP
BOTTOM
7221028

SECTION 5 - PREVENTIVE MAINTENANCE

5-1 EXTERNAL CLEANING

CAUTION: DISCONNECT POWER FROM TEST SET TO AVOID POSSIBLE DAMAGE TO ELECTRONIC CIRCUITS.

STEP PROCEDURE

1. Clean front panel, switches and display face with soft lint-free cloth. If dirt is difficult to remove, dampen cloth with water and liquid detergent.

2. Remove grease, fungus and ground-in dirt from surfaces with soft lint-free cloth dampened (not wet) with denatured alcohol.

3. Remove dust and dirt from connectors with soft-bristled brush.

   NOTE: Cover connectors, not in use, with suitable dust cover to prevent tarnishing of connector contacts.

4. Clean cables with soft lint-free cloth.

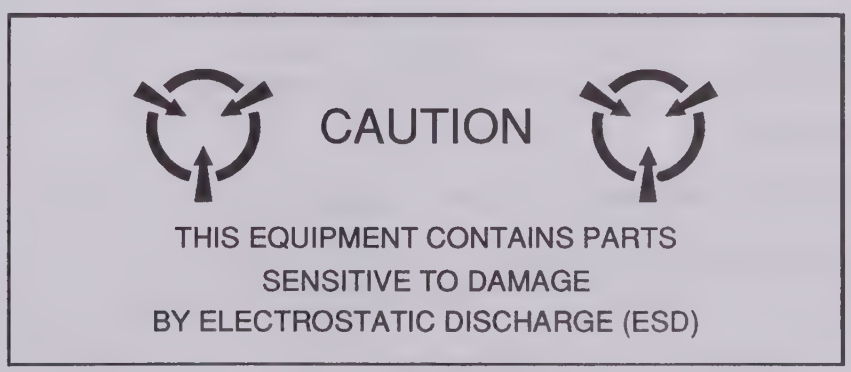
5. Paint exposed metal surface to avoid corrosion.

5-2 INTERNAL CLEANING

CAUTION: DO NOT MOVE COMPONENTS ON CIRCUIT BOARDS OR DISASSEMBLE CONNECTORS NEEDLESSLY TO AVOID POSSIBLE DAMAGE.

DO NOT OPEN COMPLEX INTERNAL MODULES FOR SOLE PURPOSE OF CLEANING AND INSPECTION.

PREVENTIVE MAINTENANCE PROCEDURES FOR THE UNIT REQUIRING REMOVAL OF CASE ASSEMBLIES SHOULD ONLY BE PERFORMED IN AN ESD ENVIRONMENT AND ALL PERSONNEL PERFORMING THE PROCEDURES SHOULD HAVE KNOWLEDGE OF ACCEPTED ESD PRACTICES AND/OR BE ESD CERTIFIED.



STEP PROCEDURE

1. Remove dust with hand-controlled dry air jet of 15 psi (1.054 kg/cm^2) and wipe internal chassis parts and frame with soft lint-free cloth moistened with alcohol.

2. Clean switches and controls with contact cleaner.

5-3 VISUAL INSPECTION

STEP PROCEDURE

1. Inspect Chassis for:
   - Tightness of sub-assemblies and chassis mounted connectors.
   - Corrosion or damage to metal surfaces.
2. Inspect Capacitors for:
   - Loose mounting, deformities or obvious physical damage.
   - Leakage or corrosion around leads.
3. Inspect Connectors for:
   - Loose or broken parts, cracked insulation and bad contacts.
4. Inspect Circuit Boards for:
   - Corrosion or damage to connectors.
   - Damage to mounted components including crystals and ICs.
   - Freedom from foreign material.
5. Inspect Resistors for:
   - Cracked, broken, charred or blistered bodies.
   - Loose or corroded soldering connections.
6. Inspect Semiconductors for:
   - Cracked, broken, charred or discolored bodies.
   - Seals around leads being in place and in good condition.
7. Inspect Switches for:
   - Loose levers, terminals and switch body contact to frame.
   - Bent or loose line switch contacts.
8. Inspect Wiring for:
   - Broken or loose ends and connections.
   - Proper dress relative to other chassis parts.

   NOTE: Verify laced wiring is tight with ends securely tied.

SECTION 6 - MECHANICAL ASSEMBLIES, PC BOARDS & SCHEMATICS

6-1 GENERAL

This section contains selected drawings to aid the technician in testing and troubleshooting the AN900 Series Spectrum Analyzers to a module level.

6-2 DRAWING INDEX

FIGURE	TITLE	PAGE
6-1	Cable Location	6-9
6-2	System Interconnect Diagram	6-15
6-3	Motherboard PC Board Assembly	6-18
6-4	System Controller Firmware Assembly	6-19

6-3 COAXIAL CABLES

The following table identifies coaxial cables by number used in the AN900 Series Spectrum Analyzers. The table provides connectors (plugs and jacks), signal, frequency and level for each coaxial cable. Use the System Interconnect Diagram as a cross-reference.

NOTE: Call-outs for cables, plugs and connectors are prefixed according to Spectrum Analyzer model (72A1 for AN930, 02A1 for AN920, 03A1 for AN930A, 04A1 for AN940) (e.g. A3J3 for the AN920 is 02A1A3J3 and W4 for the AN930A is 03A1W4.).

COAXIAL CABLE	P1 FROM (ASSEMBLY)	P2 TO (ASSEMBLY)	SIGNAL	FREQUENCY	LEVEL
W2 (N/A-AN920)	A10A1J5 (YIG Synthesizer)	A9A1J3 (Microwave Receiver)	µWAVE LO	3 to 13 GHz	>+9 dBm (+13 dBm)
W4	A9AT1J2 (Microwave Receiver-AN930, AN930A, AN940/ Attenuator-AN920)	A11J2 (RF Receiver)	0-2.9 GHz	100 MHz	-30 dBm
W5 (N/A-AN920)	A9A1J2 (Microwave Receiver)	A14J2 (410 MHz IF Firmware)	µWAVE 410 MHz	410.7 MHz	-30 dBm (with input--30 dBm) Band 1: (±8 dB) Band 2: (±16 dB)
W6	W6J1 (EXTERNAL MIXER IF Connector) ([front panel] Composite)	A14J4 (410 MHz IF Firmware)	EXTERNAL MIXER IF	410.7 MHz	-30dBm
W7	A4J4 (Frequency Reference Firmware)	A12J1B-A12J1A (REF OUT Connector) (Front Panel)	100 MHz CAL	100 MHz	-30 dBm (±0.25 dB)

Table 6-1 Coaxial Cable List

COAXIAL CABLE	P1 FROM (ASSEMBLY)	P2 TO (ASSEMBLY)	SIGNAL	FREQUENCY	LEVEL
W8	A12A4J2 (Front Panel)	A18J4 (Analog Firmware)	EXT TRIG/ SCOPE	Video from EXTERNAL INPUT Connector	
W9	A10A1J2 (YIG Synthesizer) (w/o Option 02)	(No P2) W9J1 (EXTERNAL MIXER LO Connector) ([front panel] Composite)	AUX LO	3 to 13 GHz	>+10 dBm
W10	A22A1J1 (2.9 GHz Tracking Generator) (Option 02)	(No P2) W10J1 (EXTERNAL MIXER LO Connector) ([front panel] Composite)	EXT MXR LO	3 to 13 GHz	>+10 dBm
W11	A13J4 (Sweep Synthesizer Firmware)	A22A1J2 (2.9 GHz Tracking Generator) (Option 02)	SWEEP	0.3 to 5 V_{P-P} Ramp	
W12	A22A2AT1J1 (2.9 GHz Tracking Generator) (Option 02)	(No P2) W12J1 (TRACKING GENERATOR Connector) ([front panel] Composite)	0-3 GHz	100 kHz to 2.9 GHz (Example- 100 MHz)	0 to -70 dBm
W13	A11J7 (RF Receiver)	A22A1J1 (2.9 GHz Tracking Generator) (Option 02)	3.2 GHz LO	3.2 GHz	-3 dBm (±2 dB)
W14	A13J3 (Sweep Synthesizer Firmware)	A10A2J3 (YIG Synthesizer)	SWEEP	0.3 to 5 V_{P-P} Ramp	
W15	A4J9 (Frequency Reference Firmware)	A11J4 (RF Receiver)	400 MHz LO	400 MHz	+5 dBm
W16	A4J6 (Frequency Reference Firmware)	A11J5 (RF Receiver)	100 MHz CAL	100 MHz	-10 dBm
W17	A11J1 (RF Receiver)	A14J3 (410 MHz IF Firmware)	RF- 410 MHz	410.7 MHz	-30 dBm
W18	A10A1J4 (YIG Synthesizer)	A11J3 (RF Receiver)	RF LO	3.6 to 6.5 GHz	>+6 dBm (+10 dBm)
W19	A4J8 (Frequency Reference Firmware)	A13J6 (Sweep Synthesizer Firmware)	4 MHz REF	4 MHz	Logic
W20	A3J3 (Sampler Synthesizer Firmware)	A10A1J3 (YIG Synthesizer)	101- 107 MHz	101.56 to 106.9 MHz	0 dBm (±2 dB)
W21	J2B-J2A (EXT REF IN Connector) ([rear panel] Composite)	A4J2 (Frequency Reference Firmware)	EXT 10 MHz REF	10 MHz	1 to 10 V_{P-P}

Table 6-1 Coaxial Cable List (Continued)

COAXIAL CABLE	P1 FROM (ASSEMBLY)	P2 TO (ASSEMBLY)	SIGNAL	FREQUENCY	LEVEL
W22	A26/A27J1 (High [Option 09] or Medium Stability Time Base)	A4J3 (Frequency Reference Firmware)	10 MHz	10 MHz	+13 dBm (±2 dB)
W23	A4J10 (Frequency Reference Firmware)	A14J6 (410 MHz IF Firmware)	400 MHz LO	400 MHz	+5 dBm
W24	A4J1 (Frequency Reference Firmware)	A18J5 (Analog Firmware)	1 MHz REF	1 MHz	Logic
W25	A4J5 (Frequency Reference Firmware)	A3J1 (Sampler Synthesizer Firmware)	100 MHz LO	100 MHz	0 dBm (±2 dB)
W26	A4J7 (Frequency Reference Firmware)	A3J2 (Sampler Synthesizer Firmware)	10 MHz REF	10 MHz	Logic
W27	A14J1 (410 MHz IF Firmware)	J3B-J3A (410.7 MHz IF OUT Connector) ([rear panel] Composite)	410.7 MHz IF	410.7 MHz	-30 dBm (±3 dB)
W28	A14J5 (410 MHz IF Firmware)	A15J2 (IF BW Standard PC Board) or A24/A25J2 (Supplemental BW Filters [Option 07-AN930]/ Quasi-Peak Detector [Option 08])	10.7 MHz IF	10.7 MHz	-30 dBm
W29	A24/A25J1 (Supplemental BW Filters [Option 07-AN930]/ Quasi-Peak Detector [Option 08])	A15J2 (IF BW Standard PC Board)	10.7 MHz	10.7 MHz	-30 dBm
W30	A15J1 (IF BW Standard PC Board)	A16J3 (Log Amp Firmware)	10.7 MHz	10.7 MHz	-3 dBm (10 dB Log)
W31	A18J1 (Analog Firmware)	A16J2 (Log Amp Firmware)	1 MHz REF	1 MHz	Logic
W32	A16J4 (Log Amp Firmware)	A18J2 (Analog Firmware)	LOG VIDEO	Video	-400 mV to +400 mV
W33	A16J1 (Log Amp Firmware)	A18J6 (Analog Firmware)	10.7 MHz	10.7 MHz	-5 dBm
W34	A18J7 (Analog Firmware)	J4B-J4A (10.7 MHz IF OUT Connector) ([rear panel] Composite)	10.7 MHz	10.7 MHz	-5 dBm (BW <10 MHz)

Table 6-1 Coaxial Cable List (Continued)

COAXIAL CABLE	P1 FROM (ASSEMBLY)	P2 TO (ASSEMBLY)	SIGNAL	FREQUENCY	LEVEL
W35	A18J3 (Analog Firmware)	A17J1 (Digitizer Firmware)	VIDEO	Video	0.5625V/ Div
W36	A2J6 (Motherboard PC Board)	J1B-J1A (VIDEO OUT Connector) ([rear panel] Composite)	AUX VIDEO	Video	0.1 V/Div
W37	A13J1 (Sweep Synthesizer Firmware)	A10A2J2 (YIG Synthesizer)	2-3.5 MHz	2 to 3.5 MHz	TTL
W38	A10A1J2 (YIG Synthesizer)	A22A2J3 (2.9 GHz Tracking Generator) (Option 02)	AUX LO	3 to 13 GHz	>+10 dBm
NOTE: Signal path levels taken with Center Frequency set to 100 MHz, Frequency Span set to 0 Hz/Div, RBW set <5 MHz 10 dB Log using calibrated source.					

Table 6-1 Coaxial Cable List (Continued)

6-4 MULTI-LINE CABLES

Table 6-2 identifies multi-line cables by number, used in the AN900 Series Spectrum Analyzers. Table 6-3 provides signal designations for pins used on each multi-line cable. Use the System Interconnect Diagram as a cross-reference.

CABLE	P1 FROM (ASSEMBLY)	P2 TO (ASSEMBLY)
W39	A19J3 (System Controller Firmware)	(No P2) W39J1 (IEEE-488 GPIB Connector) ([rear panel] Composite) and W39J2 (RS-232 Connector) ([rear panel] Composite)
W40	A2J3 (Motherboard PC Board)	(No P2) W40J1 (FUNCTION Connector) ([rear panel] Composite)
W41	A6J1 (Power Supply)	(P2) A2J4 (Motherboard PC Board) and (P3) A19J5 (System Controller Firmware)
W42	A7A2J1 (CRT)	(P2) A6J2 (Power Supply) and (P3) A20J1 (Video Controller Firmware)
W43	A2J7 (Motherboard PC Board)	(No P2) LS1 (Internal Audio Speaker)
W44	A6J5 (Power Supply)	A2J5 (Motherboard PC Board)
W45	A2J1 (Motherboard PC Board)	A12A4J1 (Front Panel)

Table 6-2 Multi-Line Cable List

CABLE	P1 FROM (ASSEMBLY)	P2 TO (ASSEMBLY)
W46	A2J2 (Motherboard PC Board)	A19J6 (System Controller Firmware) (Jack pins reversed [1-34, 2-33, ..., 34-1])
W47	A20J2 (Video Controller Firmware)	(No P2) W47J1 (EXT DISPLAY Connector) ([rear panel] Composite)
A8W1	A8 (Fan Filter)	(No P2) (P1) A6J4 (Power Supply) and (J1) B1W1P1 (Fan)
A9W1 (N/A-AN920)	(Not P1) A9 (Microwave Receiver)	(No P2) (P1) A13J5 (Sweep Synthesizer Firmware)
A9A1W1 (Only AN920)	A13J2 (Sweep Synthesizer Firmware)	(No P2) A9A1 (Attenuator)
A9AT1W1 (N/A-AN920)	A13J2 (Sweep Synthesizer Firmware)	(No P2) A9AT1 (Microwave Receiver)
A21W1	(Not P1) A21 (Battery Pack)	(No P2) (P1) A6J7 (Power Supply)
A26/A27 W1	A6J3 (Power Supply)	(No P2) A26/A27 (High [Option 09] or Medium Stability Time Base)
B1W1	A8W1J1 (Fan Filter)	(No P2) B1 (Fan)

Table 6-2 Multi-Line Cable List (Continued)

PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL
W39P1 (34-Pin)		12	D105	24	GND
1	NC	13	D102	25	NDAC
2	GND	14	D106	26	GND
3	NC (RI)	15	D103	27	IFC
4	NC (DSR)	16	D107	28	GND
5	$\overline{\text{RTS}}$	17	D104	29	SRQ
6	RXD	18	D108	30	GND
7	$\overline{\text{CTS}}$	19	EOI	31	ATN
8	TXD	20	REN	32	GND
9	DTR	21	DAV	33	GND
10	CD	22	GND	34	GND
11	D101	23	NRFD		

Table 6-3 Multi-Line Cable Signal Designations

PIN	SIGNAL
	W39J1 (9-Pin)
1	CD
2	TXD
3	RXD
4	NC
5	GND
6	DTR
7	$\overline{\text{CTS}}$
8	$\overline{\text{RTS}}$
9	NC
	W39J2 (24-Pin)
1	D101
2	D102
3	D103
4	D104
5	EQI
6	DAV
7	NRFD
8	NDAC
9	IFC
10	SRQ
11	ATN
12	GND
13	D105
14	D106
15	D107
16	D108
17	REN
18	GND
19	GND
20	GND
21	GND
22	GND
23	GND
24	GND
	W40P1 (16-Pin)
1	-12 V
2	+12 V
3	+5 V
4	IRQ-SER
5	SER-CLK
6	SER STATUS
7	SER CONTROL
8	$\overline{\text{SLAVE-SEL 7}}$
9	RLY DRV 1
10	RLY DRV 2
11	$\overline{\text{SWEEP HOLD}}$
12	SWEEP
13	AUX VIDEO
14	VIDEO COMMON
15	AUX TRIGGER
16	NC
	W40J1 (15-Pin)
1	-12 V
2	+5 V
3	SER-CLK
4	SER CONTROL
5	RLY DRV 1
6	$\overline{\text{SWEEP HOLD}}$
7	AUX VIDEO
8	AUX TRIGGER
9	+12 V
10	IRQ-SER
11	SER STATUS
12	$\overline{\text{SLAVE-SEL 7}}$
13	RLY DRV 2
14	SWEEP
15	VIDEO COMMON
	W41P1 (24-Pin)
1	GND aud/CRT
2	+12 V aud/CRT
3	+35 V
4	+5 V (Analog)
5	GND (Analog)
6	NC
7	-12 V
8	NC
9	+12 V (Analog)
10	+12 V SWEEP
11	GND (Digital)
12	+5 V (Digital)
13	NC
14	NC
15	NC
16	NC
17	GND (Analog)
18	NC
19	-12 V
20	NC
21	+12 V (Analog)
22	+12 V SWEEP (YIG)
23	GND (Digital)
24	+5 V (Digital)
	W41P2 (12-Pin)
1	GND aud/CRT
2	+12 V aud/CRT
3	NC
4	+35 V
5	GND (Digital)
6	+5 V (Analog)
7	GND (Analog)
8	ANALOG COMMON
9	-12 V
10	+12 V (Analog)
11	+12 V SWEEP
12	+12 V SWEEP (YIG)
	W41P3 (7-Pin)
1	AGND (Analog Common)
2	-12 V
3	+12 V
4	GND (Digital)
5	GND (Analog)
6	+5 V (Digital)
7	+5 V (Digital)

Table 6-3 Multi-Line Cable Signal Designations (Continued)

PIN	SIGNAL
	W42P1 (8-pin)
1	GSHSYNC
2	GSVSYNC
3	GSVIDEO
4	GND
5	GND
	GND
7	+12 V
8	NC
	W42P2 (4-Pin)
1	+12 V
2	NC
3	NC
4	GND
	W42P3 (5-Pin)
1	GSHSYNC
2	GND
3	GSVSYNC
4	GND
5	GSVIDEO
	W43P1 (2-Pin)
1	SPEAKER
2	GND aud
	W44P1/P2 (8-Pin)
1	POWER APPLIED
2	PS SHUTDOWN
3	POWER SWITCH
4	BATTERY
5	GND
6	POWER FAIL
7	LINE TRIGGER
8	NC

PIN	SIGNAL
	W45P1/P2 (30-Pin)
1	RLY DRV 1
2	RLY DRV 2
3	NC
4	NC
5	SER-CLK
6	SER CONTROL
7	$\overline{\text{SLAVE-SEL 0}}$
8	SER STATUS
9	$\overline{\text{HOST-IRQ}}$
10	RESET
11	NC
12	INTENSITY .
13	POWER APPLIED
14	POWER SWITCH
15	+5 V
16	+5 V
17	GND
18	GND
19	BATTERY
20	GND
21	+12 V
22	SPKDATA
23	GND
24	SPEAKER
25	-12 V
26	RCVR-AUDIO
27	GND-aud
28	GND-aud
29	+12 V-aud
30	+12 V-aud
	W46P1/P2 (34-Pin)
1	YIG LOCK

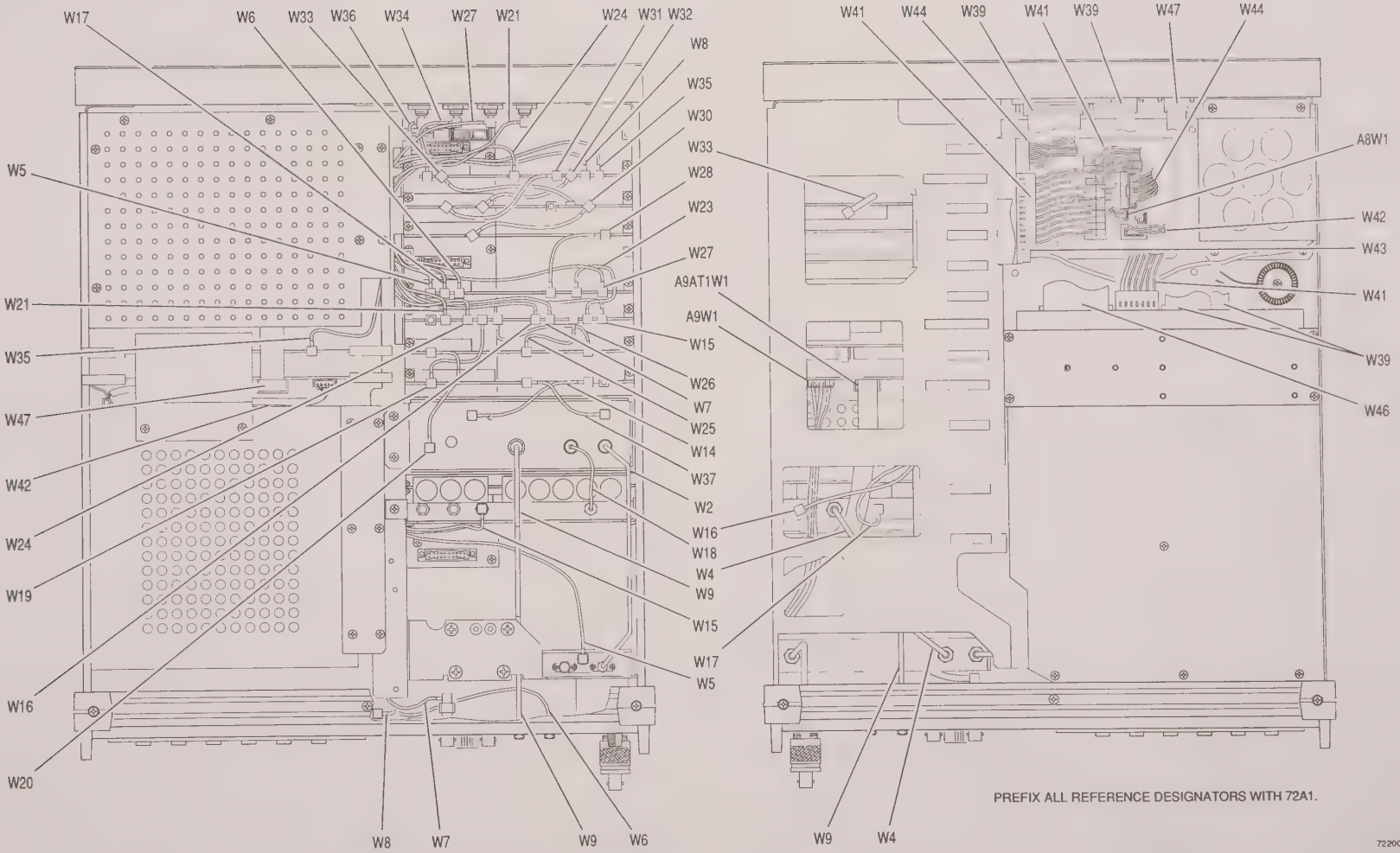
PIN	SIGNAL
2	NC
3	$\overline{\text{SER-CLK}}$
4	FREQ-HOST
5	NC (POWER FAIL)
6	INTENSITY
7	RESET
8	SPKDATA
9	NC (8 MHz CLK)
10	NC (FAN-ON)
11	NC (SLEEP 0)
12	NC (SLEEP 1)
13	NC (DIGITAL GND)
14	PS SHUTDOWN
15	IRQ-SER
16	$\overline{\text{HOST-IRQ}}$
17	SER CONTROL
18	SER STATUS
19	SER-CLK
20	$\overline{\text{SLAVE-SEL 0}}$
21	$\overline{\text{SLAVE-SEL 1}}$
22	$\overline{\text{SLAVE-SEL 2}}$
23	$\overline{\text{SLAVE-SEL 3}}$
24	$\overline{\text{SLAVE-SEL 4}}$
25	$\overline{\text{SLAVE-SEL 5}}$
26	$\overline{\text{SLAVE-SEL 6}}$
27	$\overline{\text{SLAVE-SEL 7}}$
28	+5 V
29	SWEEP-CLK
30	NC (DIGITAL GND)
31	$\overline{\text{SWEEP HOLD}}$
32	NC (DIGITAL GND)
33	ANALOG COMMON
34	TRIGGER

NOTE: W46P2 plugs into A19J6 with pins reversed (1-34, 2-33, ..., 34-1)

Table 6-3 Multi-Line Cable Signal Designations (Continued)

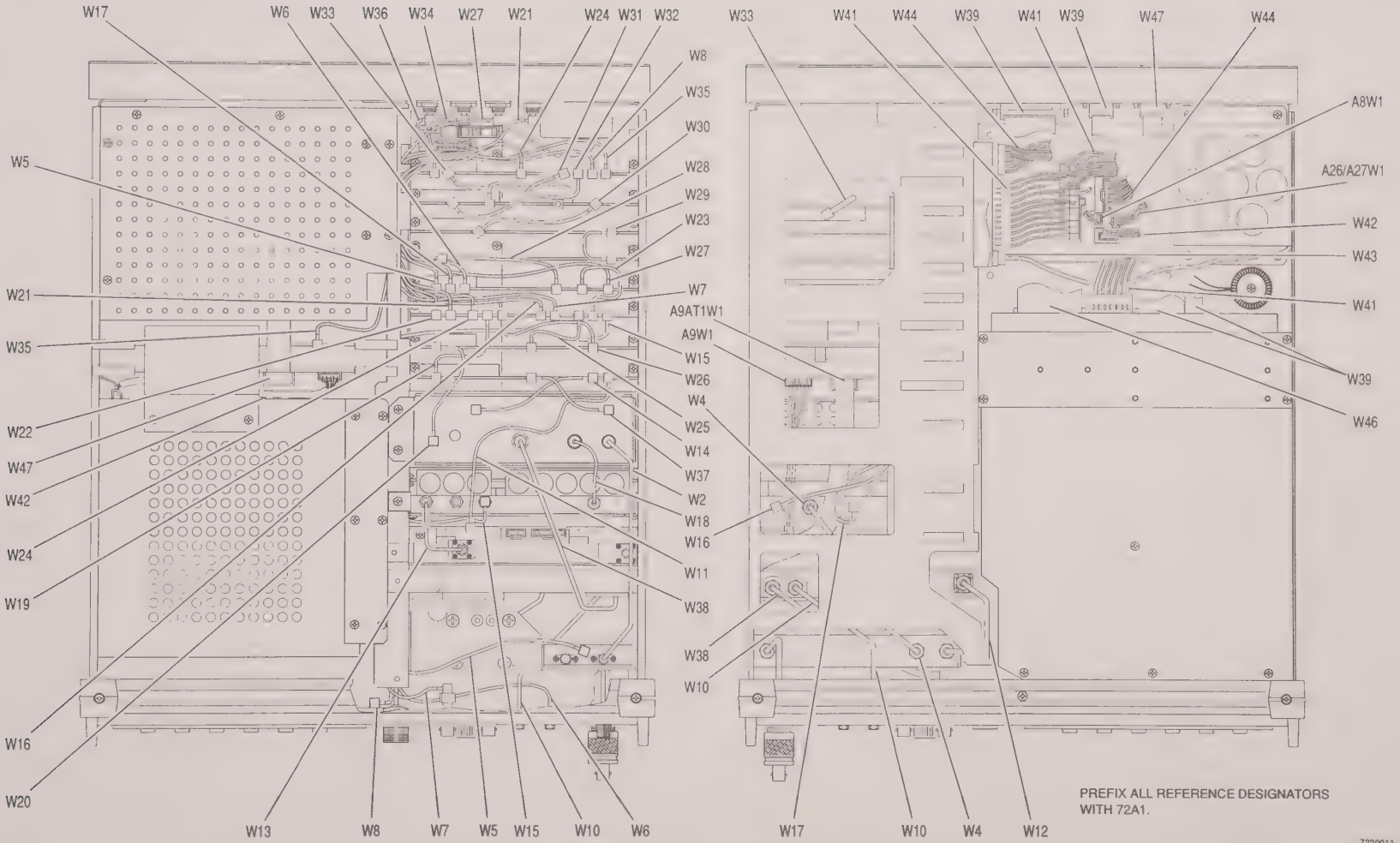
PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL
W47P1 (10-Pin)		8	BHSYNC	4	20 dB OFF
1	GND	9	BVSYNC	5	30 dB OFF
2	G'	**A8W1P1 (2-Pin)**		6	J2 SELECT
3	R'	1	+12 V FAN	7	J3 SELECT
4	B'	2	GND	8	30 dB ON
5	R	**A8W1J1 (2-Pin)**		9	20 dB ON
6	BHSYNC	1	+12 V FAN (filtered)	10	Vcc
7	G	2	GND (filtered)	**A21W1P1 (4-Pin)**	
8	BVSYNC	**A9W1P1 (6-Pin)**		1	dc IN
9	B	1	GND	2	GND
10	NC	2	HEATER +	3	BATTERY IN
W47J1 (9-Pin)		3	HEATER -	4	GND
1	GND	4	PRESELECTOR TUNE +	**A26/A27W1P1 (3-Pin)**	
2	R'	5	PRESELECTOR TUNE -	1	+12 V
3	R	6	IF BAND SEL	2	GND
4	G	**A9AT1W1P1/A9A1P1 (10-Pin)**		3	NC
5	B	1	10 dB OFF	**B1W1P1 (2-Pin)**	
6	G'	2	10 dB ON	1	+12 V FAN
7	B'	3	GND	2	GND

Table 6-3 Multi-Line Cable Signal Designations (Continued)



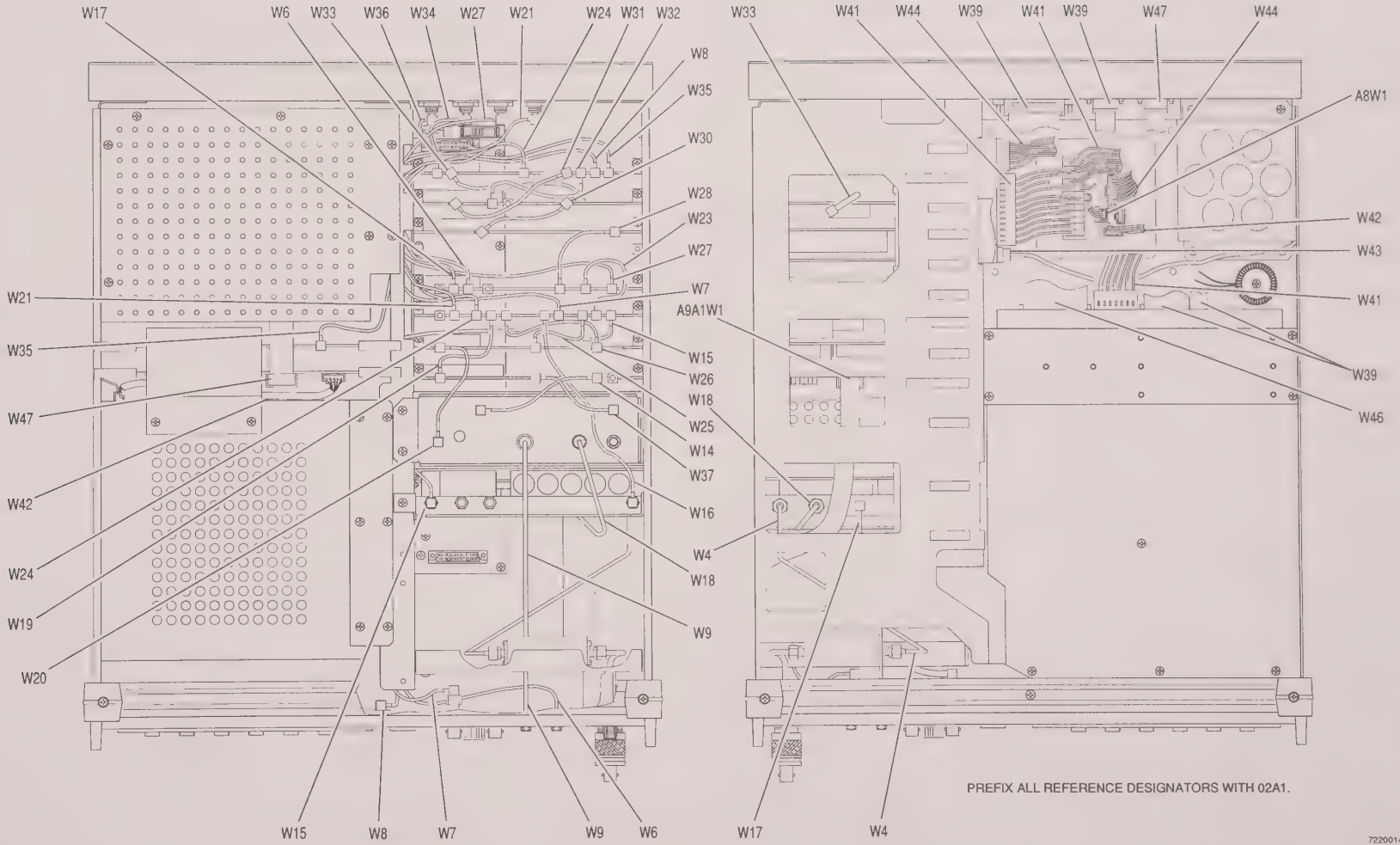
AN930 without Options Top and Bottom Views

Figure 6-1 Cable Location (Sheet 1 of 6)



AN930 with Options Top and Bottom Views

Figure 6-1 Cable Location (Sheet 2 of 6)

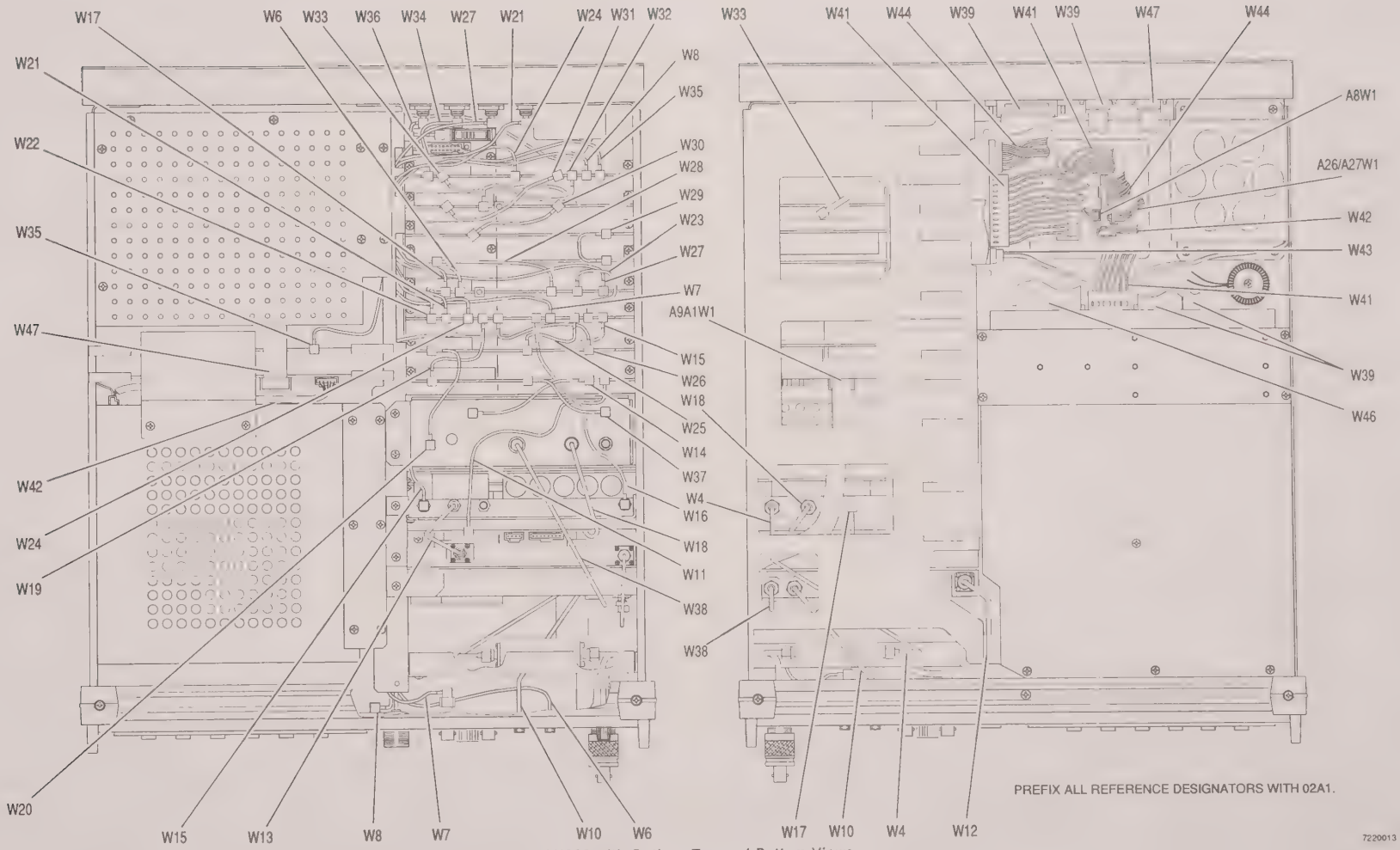


PREFIX ALL REFERENCE DESIGNATORS WITH 02A1.

7220014

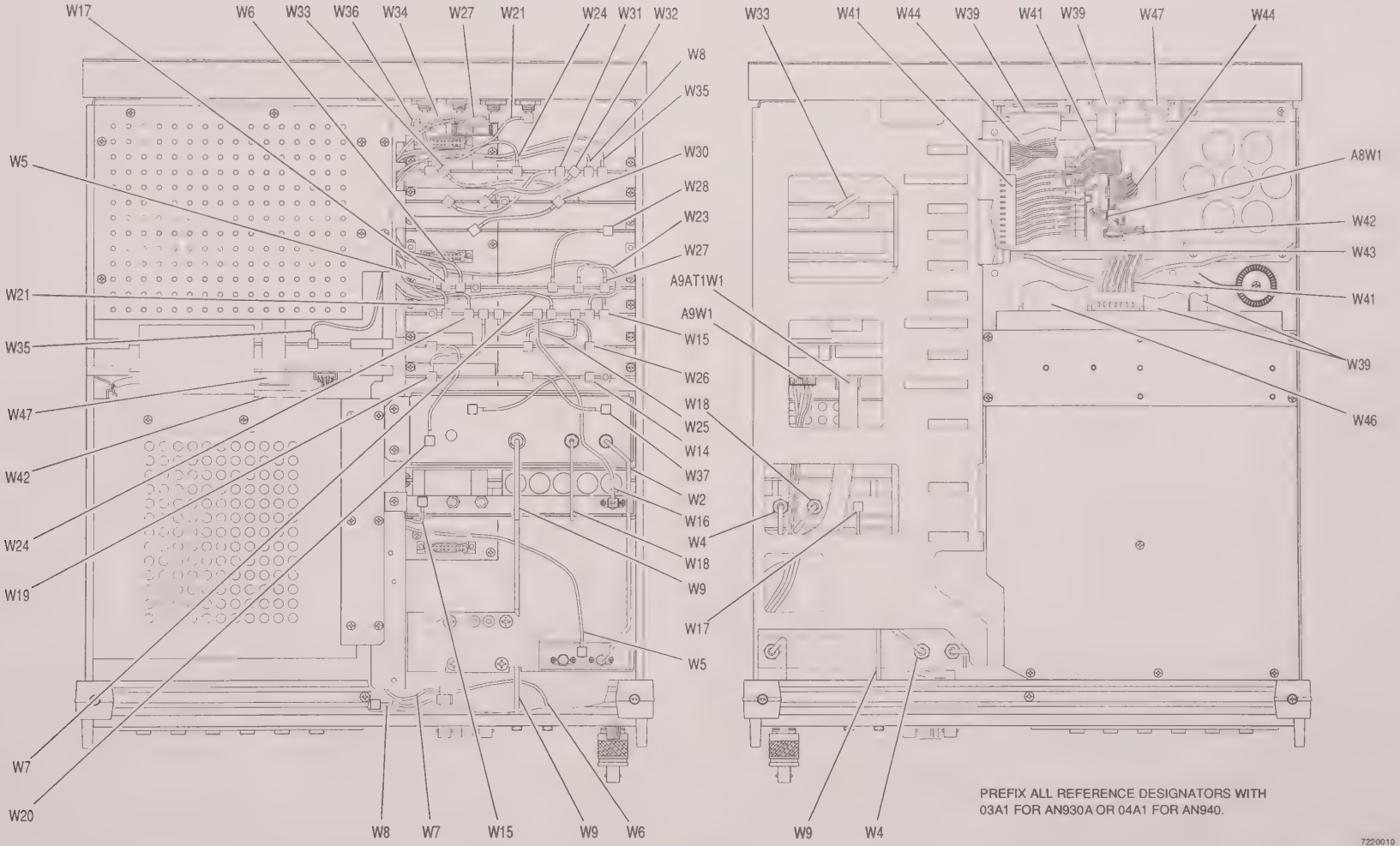
AN920 without Options Top and Bottom Views

Figure 6-1 Cable Location (Sheet 3 of 6)



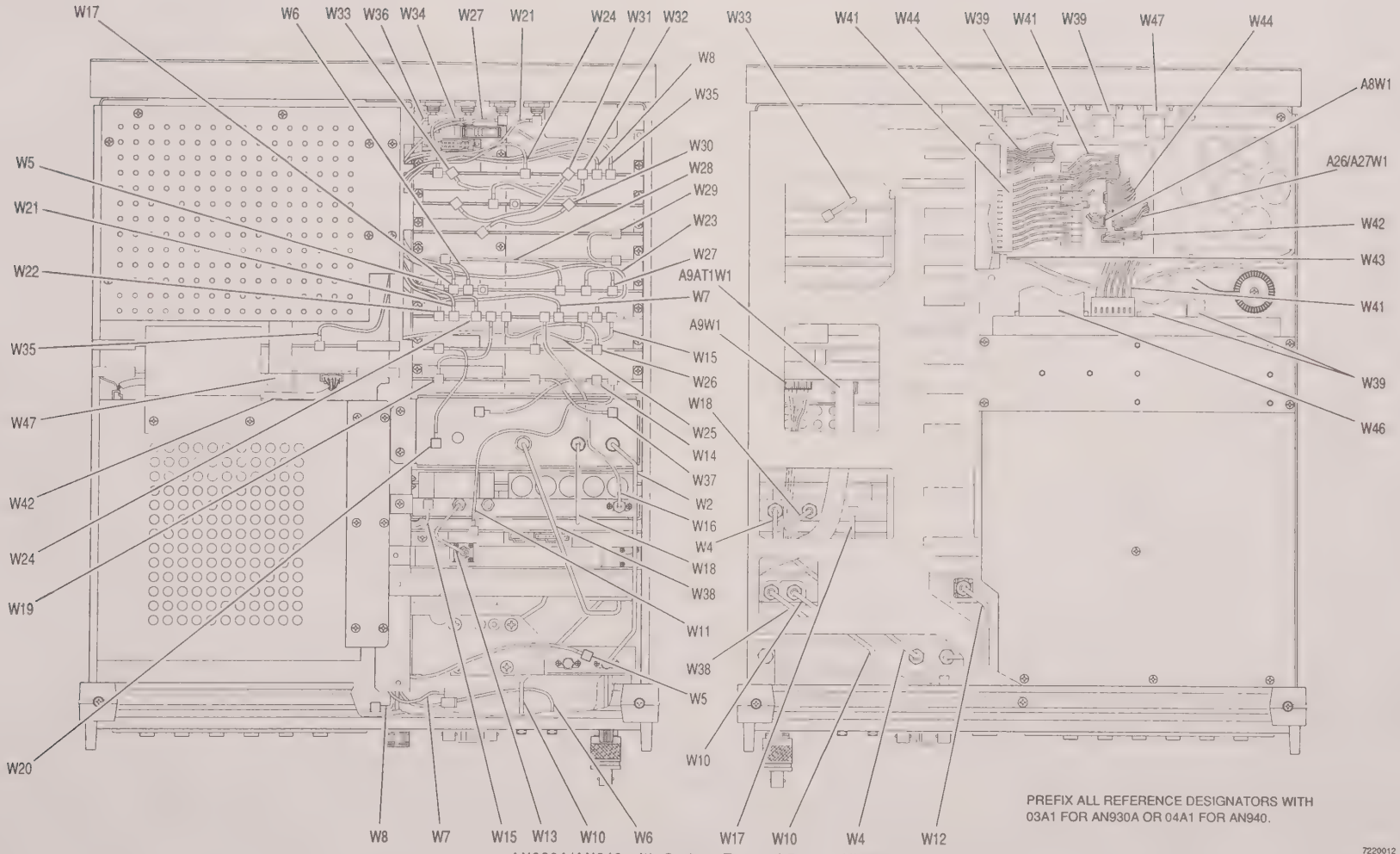
AN920 with Options Top and Bottom Views

Figure 6-1 Cable Location (Sheet 4 of 6)



AN930A/AN940 without Options Top and Bottom Views

Figure 6-1 Cable Location (Sheet 5 of 6)



AN930A/AN940 with Options Top and Bottom Views

PREFIX ALL REFERENCE DESIGNATORS WITH
03A1 FOR AN930A OR 04A1 FOR AN940.

7220012

Figure 6-1 Cable Location (Sheet 6 of 6)

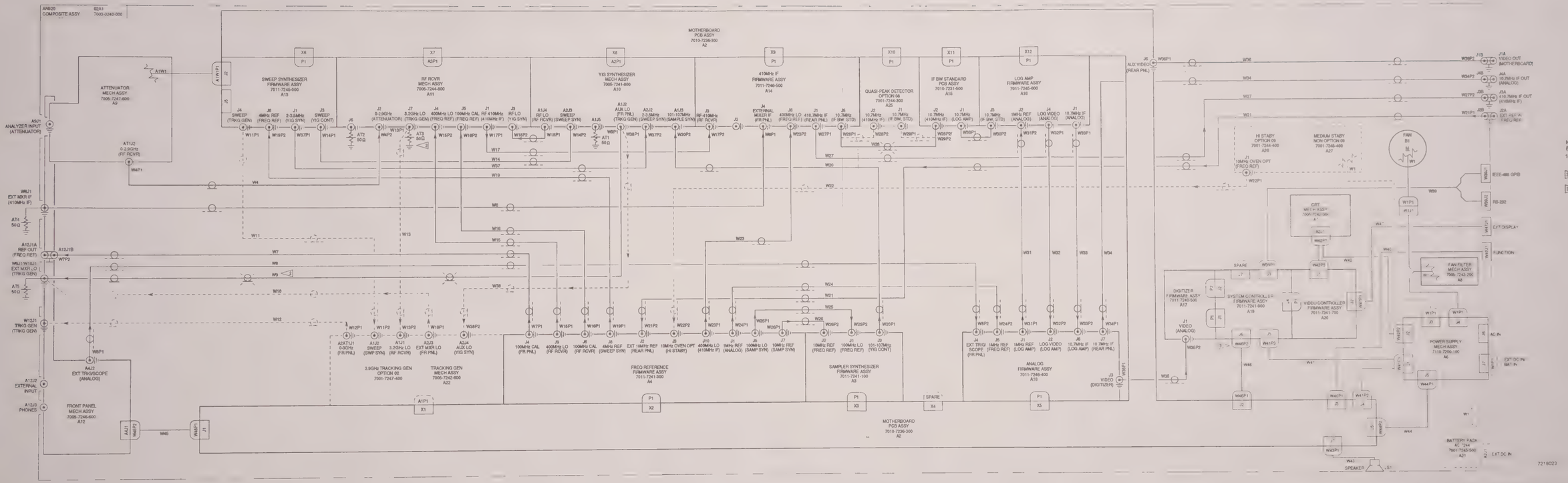


Figure 6-2 System Interconnect Diagram (Sheet 1 of 3)

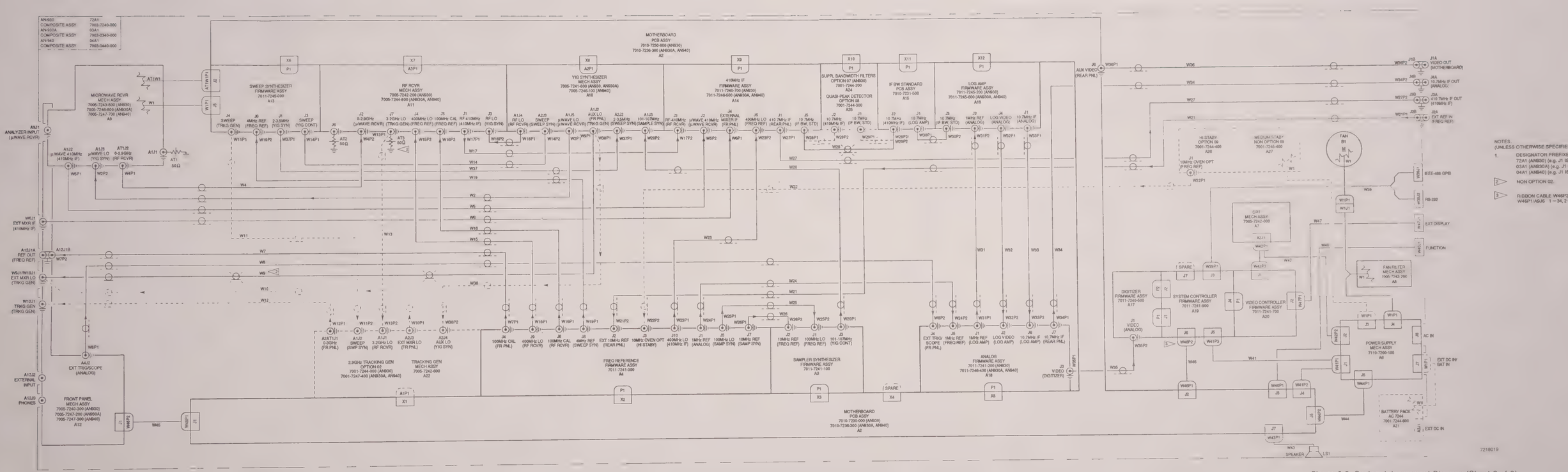


Figure 6-2 System Interconnect Diagram (Sheet 2 of 3)

System Interconnect Diagram - AN930 (0000-7240-000-B), AN930A (0000-0340-000-A) and AN940 (0000-0440-000-A)

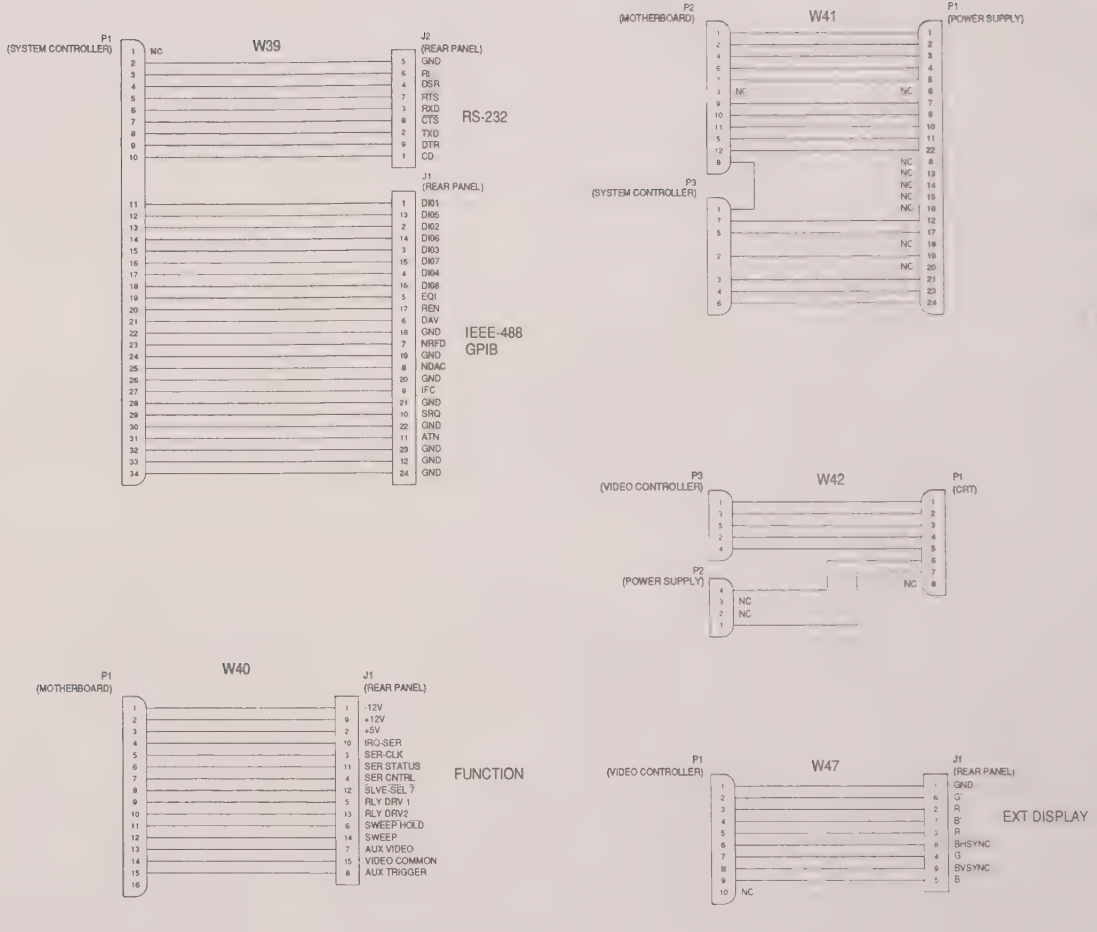
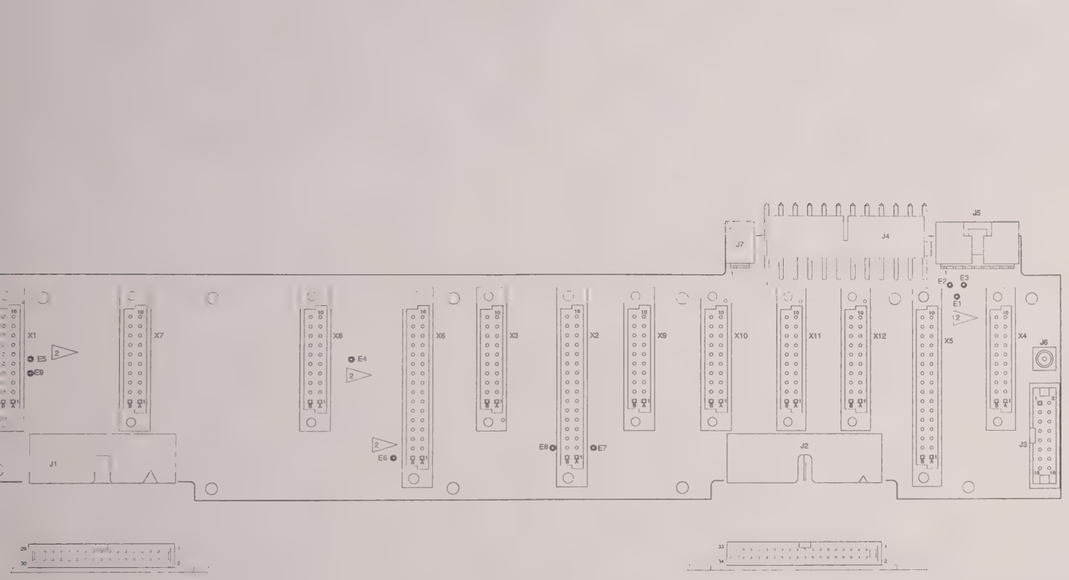
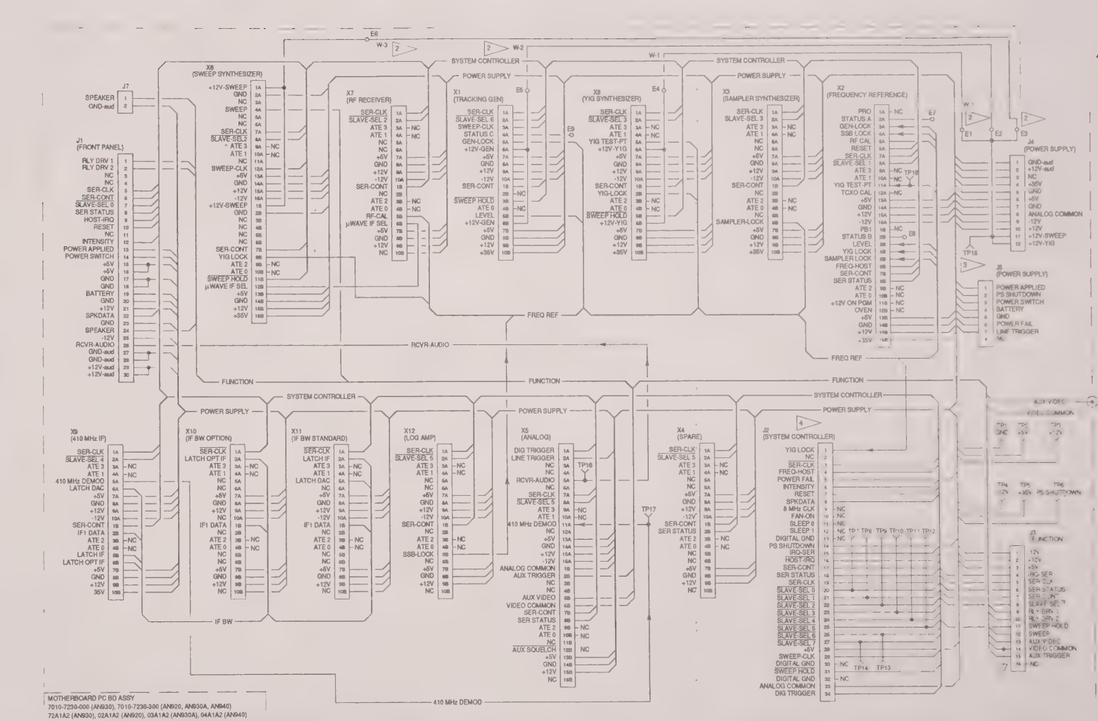


Figure 6-2 System Interconnect Diagram (Sheet 3 of 3)



Motherboard PC Board Assembly - AN930 (7010-7230-000-D1); AN920, AN930A, AN940 (7010-7236-300-A)



Motherboard PC Board Assembly Circuit Schematic - AN930 (0000-7230-000-D1); AN920, AN930A, AN940 (0000-7236-300-A)

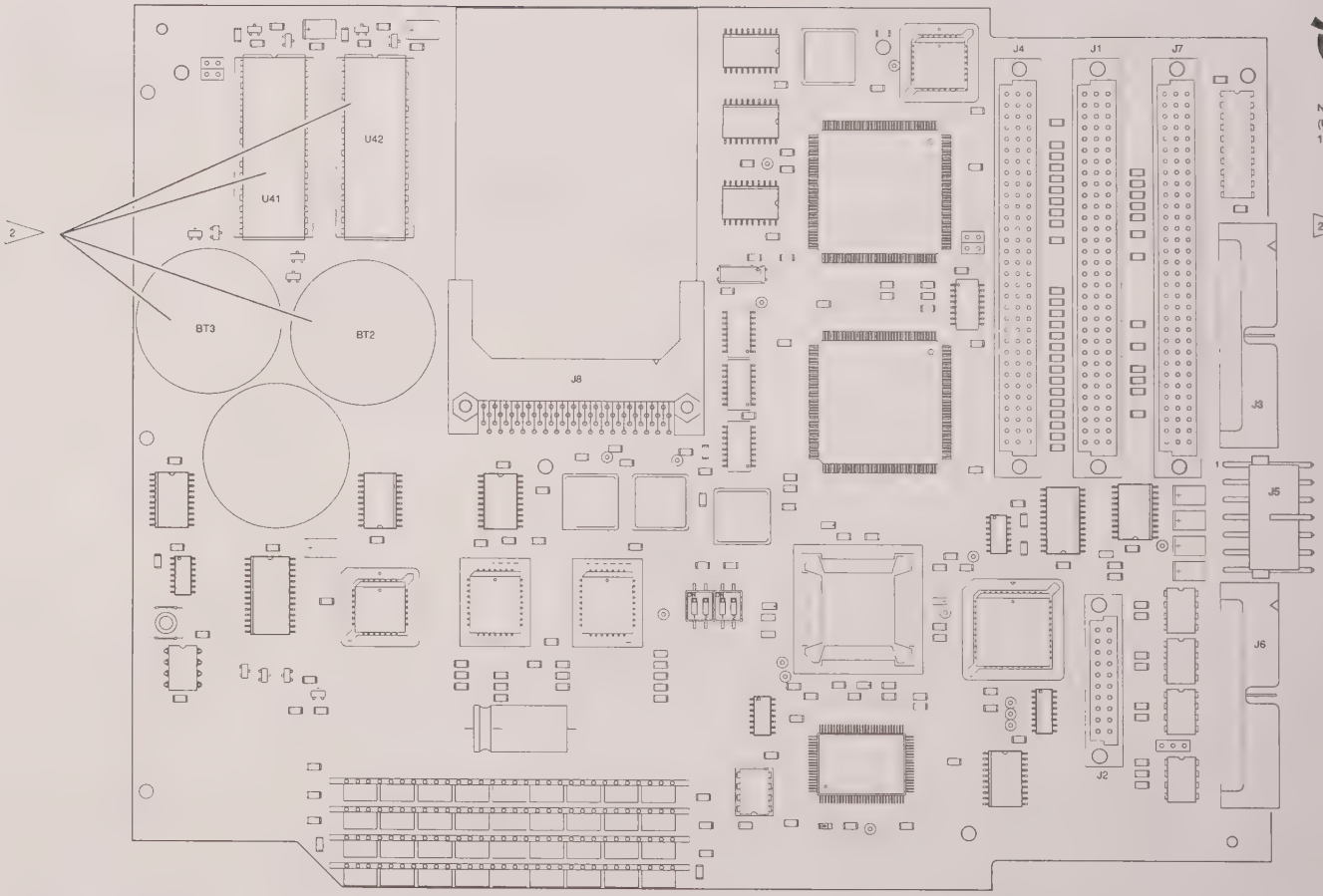
CAUTION:
CONTAINS PARTS AND ASSEMBLIES SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD).

NOTES:
(UNLESS OTHERWISE SPECIFIED)

1. DESIGNATOR PREFIXES ARE
   72A1A2 (AN930) (e.g., J1 IS 72A1A2J1)
   02A1A2 (AN920) (e.g., J1 IS 02A1A2J1)
   03A1A2 (AN930A) (e.g., J1 IS 03A1A2J1)
   04A1A2 (AN940) (e.g., J1 IS 04A1A2J1)
2. E1 THROUGH E6 AND W1 THROUGH W3 ONLY APPLY TO AN930. FOR ALL OTHER MODELS, +12V-SWEEP, +12V-GEN AND +12V-YIG, ARE CONNECTED TOGETHER WITHIN THE PC BOARD ASSEMBLY.
3. TP18 ONLY APPLIES TO AN920, AN930A, OR AN940.
4. RIBBON CABLE
   6046-7281-300
   TO MOTHERBOARD
   PIN LABELS ARE,
   1 - 34, 2 - 33, 3 - 32, ETC.

7218017

Figure 6-3 Motherboard PC Board Assembly



CAUTION:
CONTAINS PARTS AND ASSEMBLIES SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD).

NOTES
(UNLESS OTHERWISE SPECIFIED)

1. DESIGNATOR PREFIXES ARE:
   72A1A19 (e.g. J1 IS 72A1A19J1)
   02A1A19 (e.g. J1 IS 02A1A19J1)
   03A1A19J1 (e.g. J1 IS 03A1A19J1)
   04A1A19J1 (e.g. J1 IS 04A1A19J1)

2 P/O OPTION 06 MEMORY EXPANSION (AN930). (STANDARD FOR ALL OTHER MODELS). BT2, BT3, U41, U42.

PREFIX ALL REFERENCE DESIGNATORS WITH 72A1A19 (AN930), 02A1A19 (AN920), 03A1A19 (AN930A) OR 04A1A19 (AN940).

System Controller Firmware Assembly (7011-7241-900-C2)

Figure 6-4 System Controller Firmware Assembly (Sheet 1 of 3)

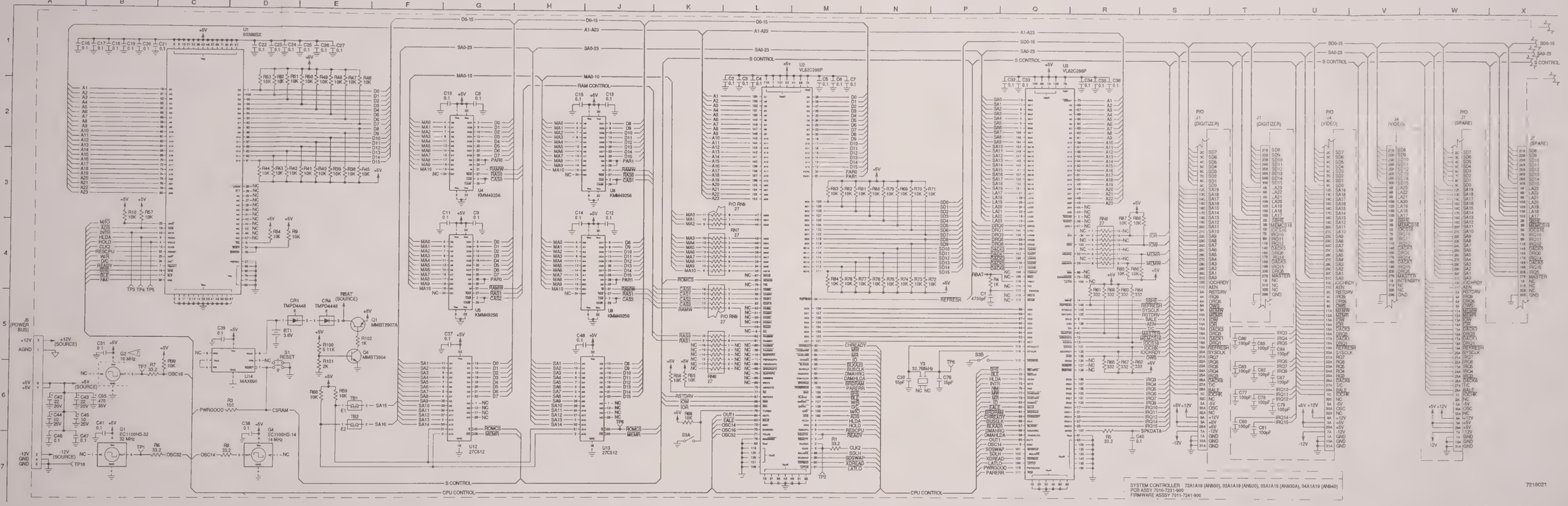
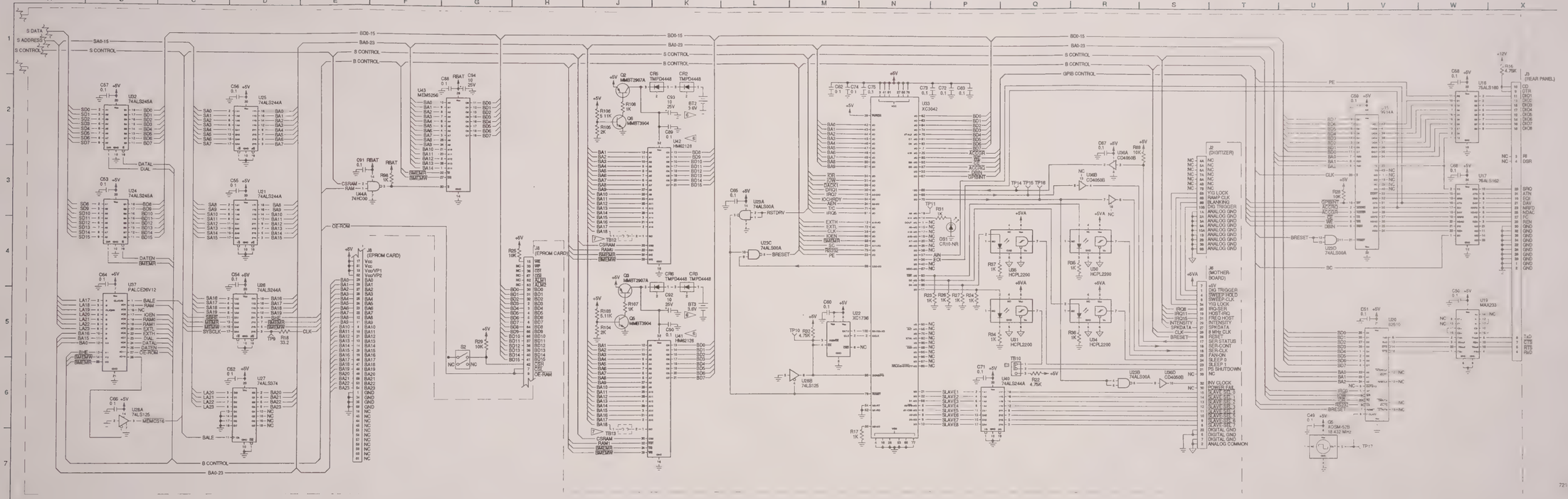


Figure 6-4 System Controller Firmware Assembly (Sheet 2 of 3)

System Controller Firmware Assembly Circuit Schematic (0000-7241-900-C1)



CAUTION:
CONTAINS PARTS AND ASSEMBLIES SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD).

NOTES:
(UNLESS OTHERWISE SPECIFIED)

1. DESIGNATOR PREFIXES ARE:
   72A1A19 (AN930) (e.g. R1 IS 72A1A19R1)
   02A1A19 (AN920) (e.g. R1 IS 02A1A19R1)
   03A1A19 (AN930A) (e.g. R1 IS 03A1A19R1)
   04A1A19 (AN940) (e.g. R1 IS 04A1A19R1)
2. ALL RESISTORS ARE 1/8W, 1% TOLERANCE.
3. ALL RESISTANCE IS EXPRESSED IN OHMS.
4. ALL CAPACITANCE IS EXPRESSED IN MICROFARADS
5. ALL INDUCTANCE IS EXPRESSED IN MICROHENRYS.
6. P/O OPTION 06 MEMORY EXPANSION (AN930) (STANDARD FOR ALL OTHER MODELS) BT2, BT3, U41, U42.
7. NOT INSTALLED.

7218022

Figure 6-4 System Controller Firmware Assembly (Sheet 3 of 3)

System Controller Firmware Assembly Circuit Schematic (0000-7241-900-C1)

SECTION 7 - PARTS LIST

7-1 GENERAL

This section contains the part numbers and descriptions for replaceable parts and assemblies in the AN900 Series Spectrum Analyzers.

7-2 PARTS LISTING OF AN930 ASSEMBLIES

Prefix all reference designators with 72A1.

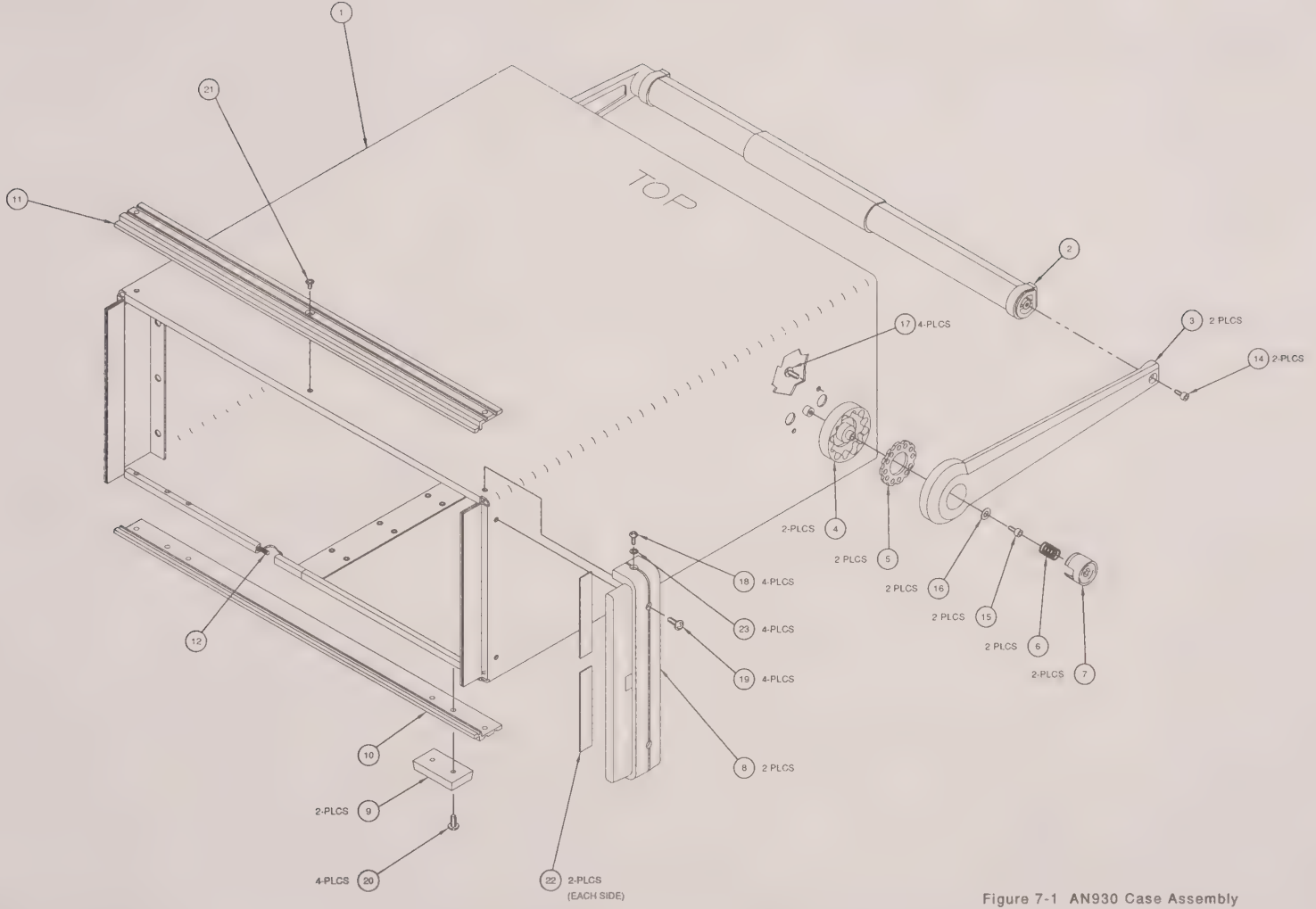


Figure 7-1 AN930 Case Assembly

7218034

7-2-1 CASE ASSEMBLY (7005-7241-600-A3)

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
*01	1412-7271-100	CASE, AN930
*02	1407-7270-303	HANDLE, MOLDED GRIP 15.25 LG
*03	1407-7270-000	HANDLE, 8.5" TILT BAIL
*04	2510-7270-100	HUB, TILT BAIL HANDLE INNER
*05	2808-7270-200	DISC, HANDLE INDEXING
*06	2106-0000-012	CMPRSN SPR.36 OD*.50 FREE LGTH
*07	2402-7270-500	PUSHBUTTON, TILT BAIL HANDLE
*08	1421-7270-900	FOOT, MOLDED CASE
*09	1421-7204-000	FOOT, MOLDED PLASTIC RECT,BLK*
*10	2400-7282-300	TRIM, BOTTOM CASE EXTRUSION
*11	2400-7282-100	TRIM, TOP CASE EXTRUSION
*12	2525-0007-000	GASKET, ROUND, WIRE MESH *
*14	2805-0500-002	SCREW, 8-32 1/2 SHCS BLACK
*15	2804-0625-002	SCREW, 6-32 X 5/8 SHCSSS
*16	2840-0000-024	WASHER, FLAT,ID.160OD.375TK.032
*17	2804-0250-006	SCREW, 6-32 X 1/4 PPHM
*18	2804-0375-008	SCREW, #6-32 X 3/8 PHMS BLACK
*19	2804-0188-008	SCREW, #6-32 X 3/16 PHMS BLACK
*20	2804-0500-008	SCREW, #6-32 X 1/2 PHMS BLACK
*21	2804-0250-010	SCREW, 6-32 X 1/4 PFH BLK OX SS
*22	1050-0000-285	TAPE, SCOTCH VHB 1/2" WIDE
*23	2840-0000-026	WASHER, LOCK, SPLIT, 6

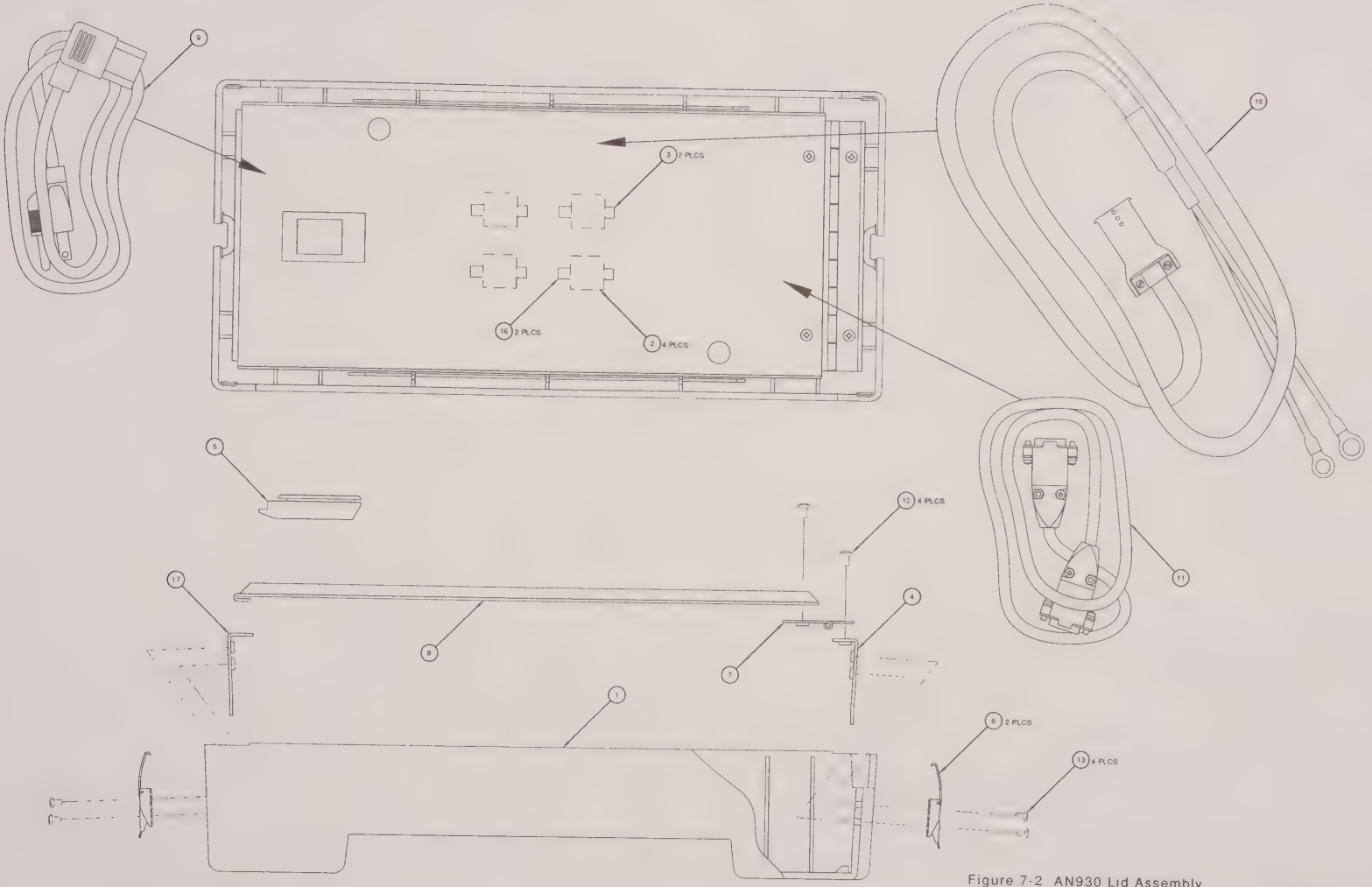


Figure 7-2 AN930 Lid Assembly

7218035

7-2-2 LID ASSEMBLY (7005-7240-100-A2)

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
*01	1414-7270-700	COVER, FRONT MOLDED
*02	2111-0000-002	CLIP, COMPONENT,ADHESIVE,.25DIA
*03	5106-0000-038	FUSE, 1.25,GL,FAST,250V,5 A (110 V UNIT)
*04	1400-7264-500	BRKT, SIDE BATTERY PACK
*05	2850-0000-109	LATCH, SLIDE-LATCH *
*06	2832-0001-007	LATCH, OVER-CENTER DRAW SS *
*07	2832-7264-900	HINGE, FRONT COVER
*08	1405-7265-000	PANEL, FRONT COVER
*09	6041-0001-001	CABLE ASSY, IEC R.A,BELD 17545
*10	7021-7282-900	MINOR ASSY, DC POWER CORD
*11	6041-9001-100	CABLE, SHIELDED RS-232C, 6FT
*12	2804-0250-006	SCREW, 6-32 X 1/4 PPHM
*13	2803-0250-006	SCREW, 4-40 X 1/4 PPHM
*16	5106-4402-500	FUSE, 1.25,GL,FAST,250V,2.5 A (220 V UNIT)
*17	1400-7263-600	BRACKET, FRONT COVER

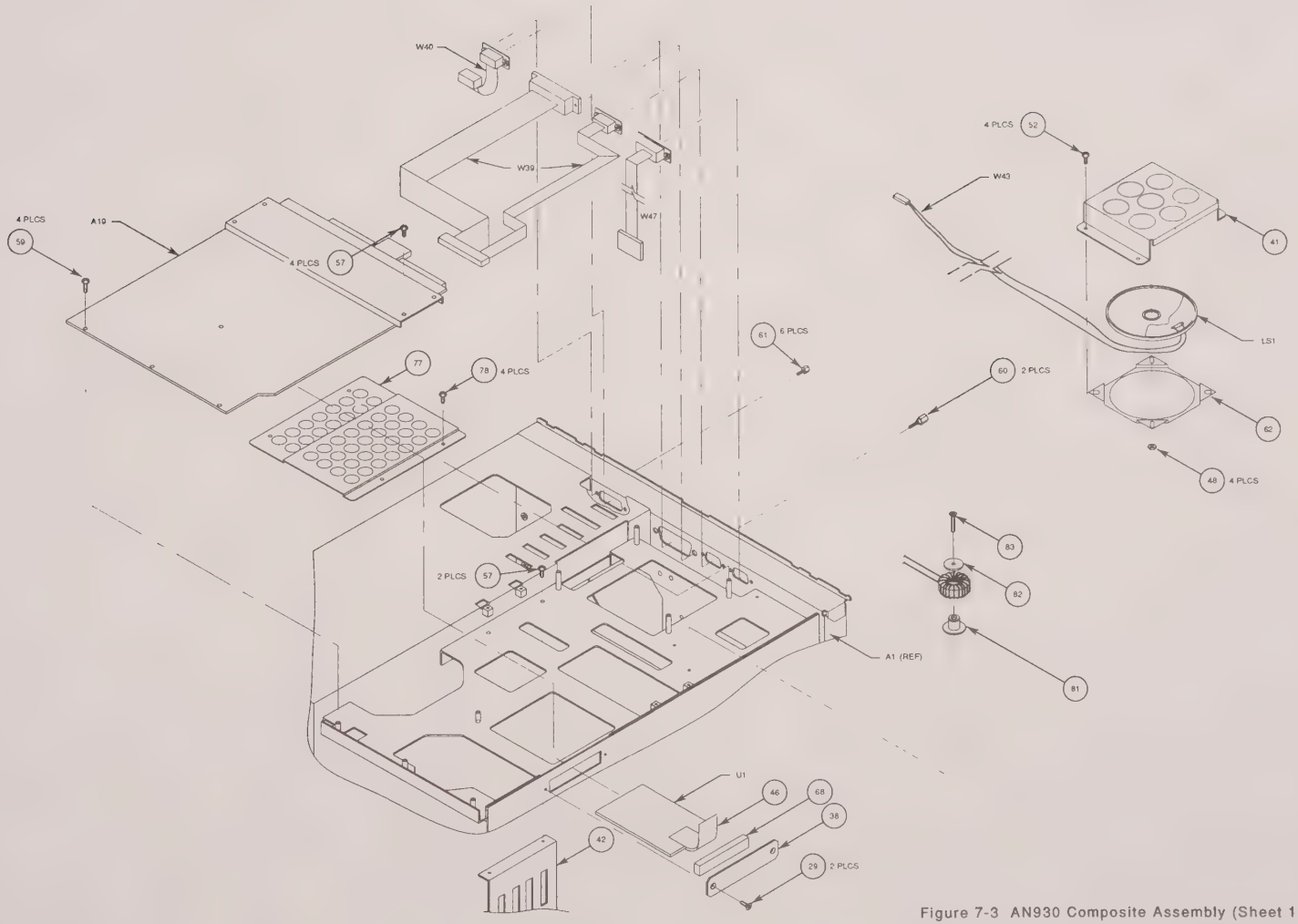


Figure 7-3 AN930 Composite Assembly (Sheet 1 of 4)

7218030

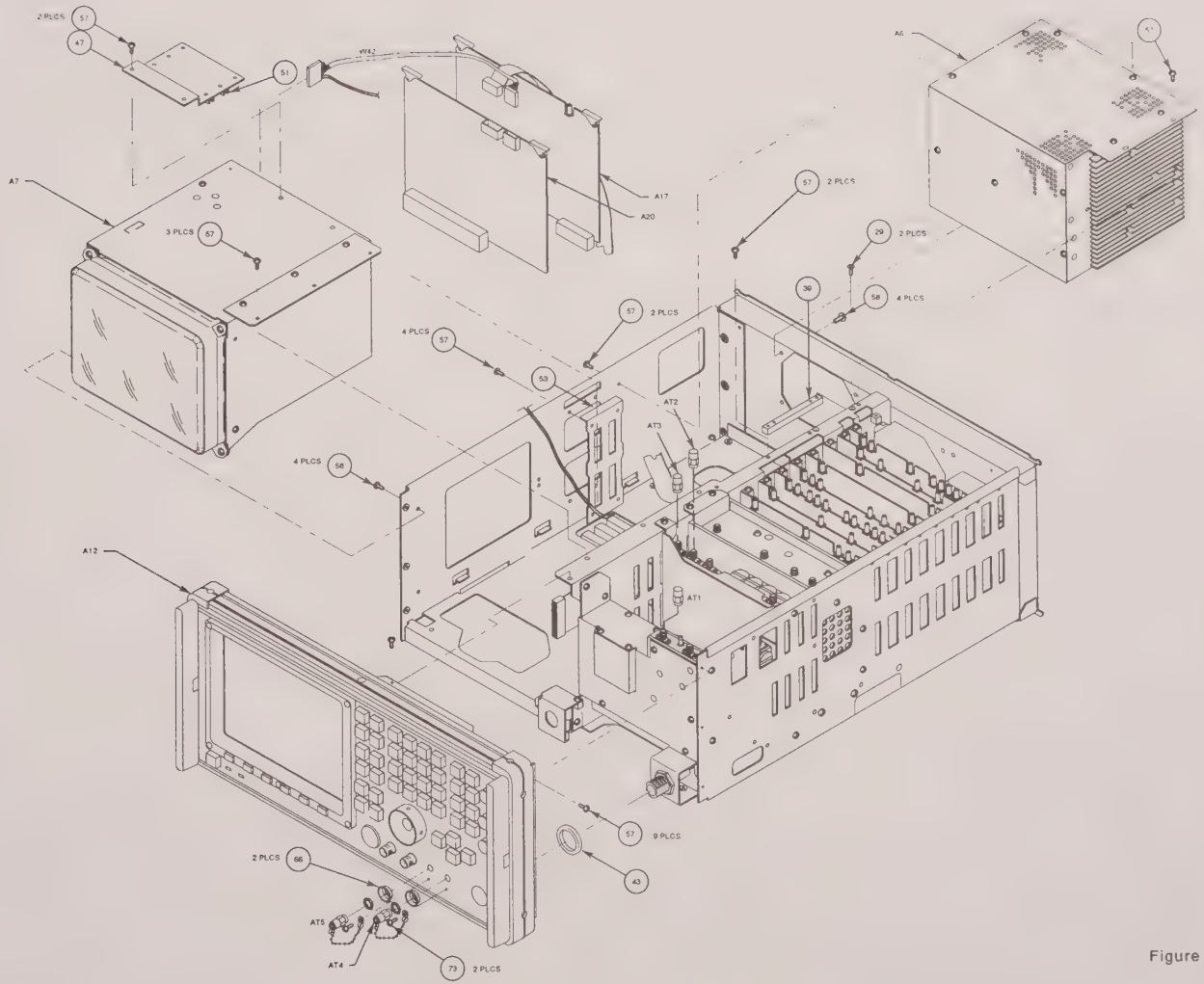


Figure 7-3 AN930 Composite Assembly (Sheet 2 of 4)

7218031

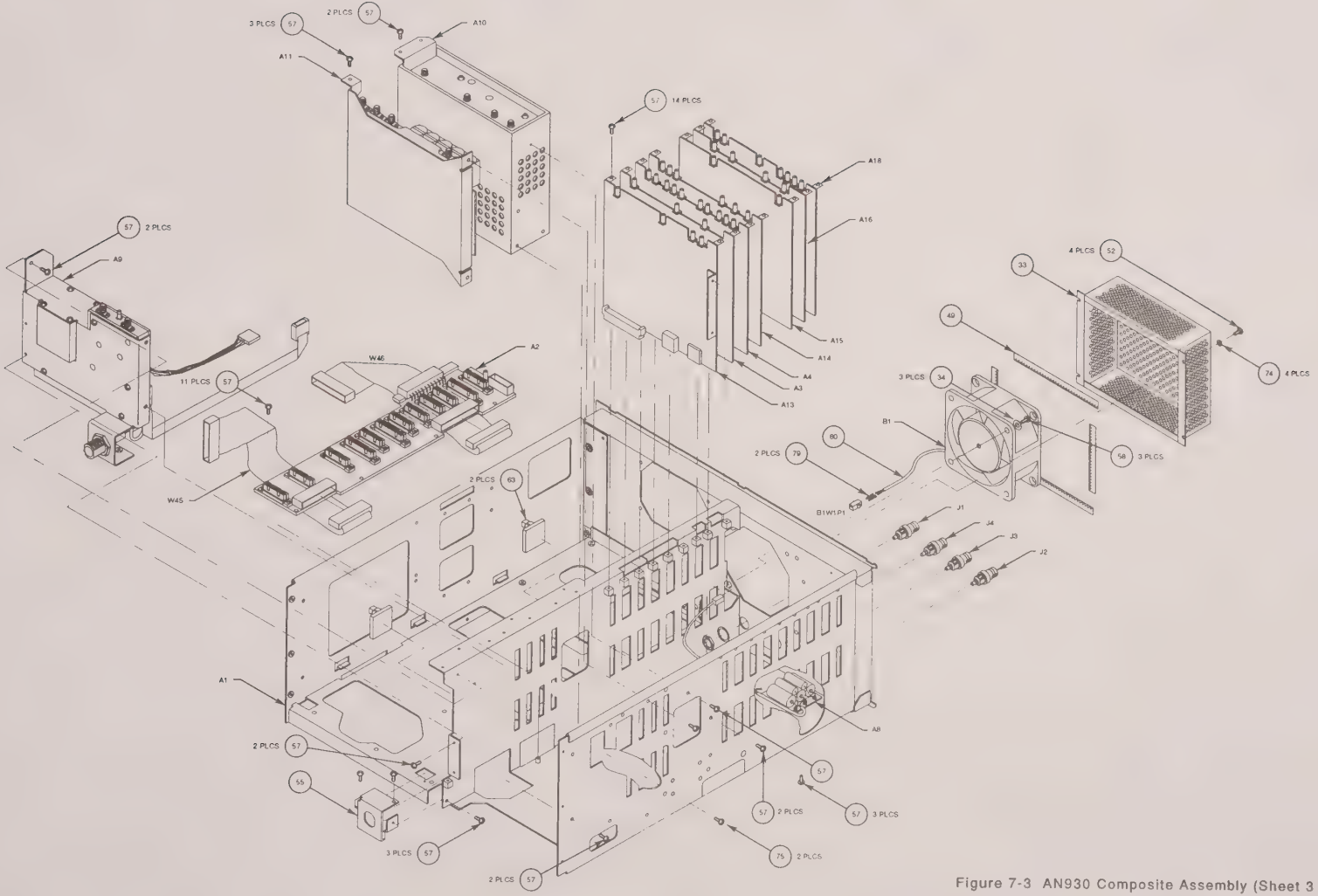


Figure 7-3 AN930 Composite Assembly (Sheet 3 of 4)

7218032

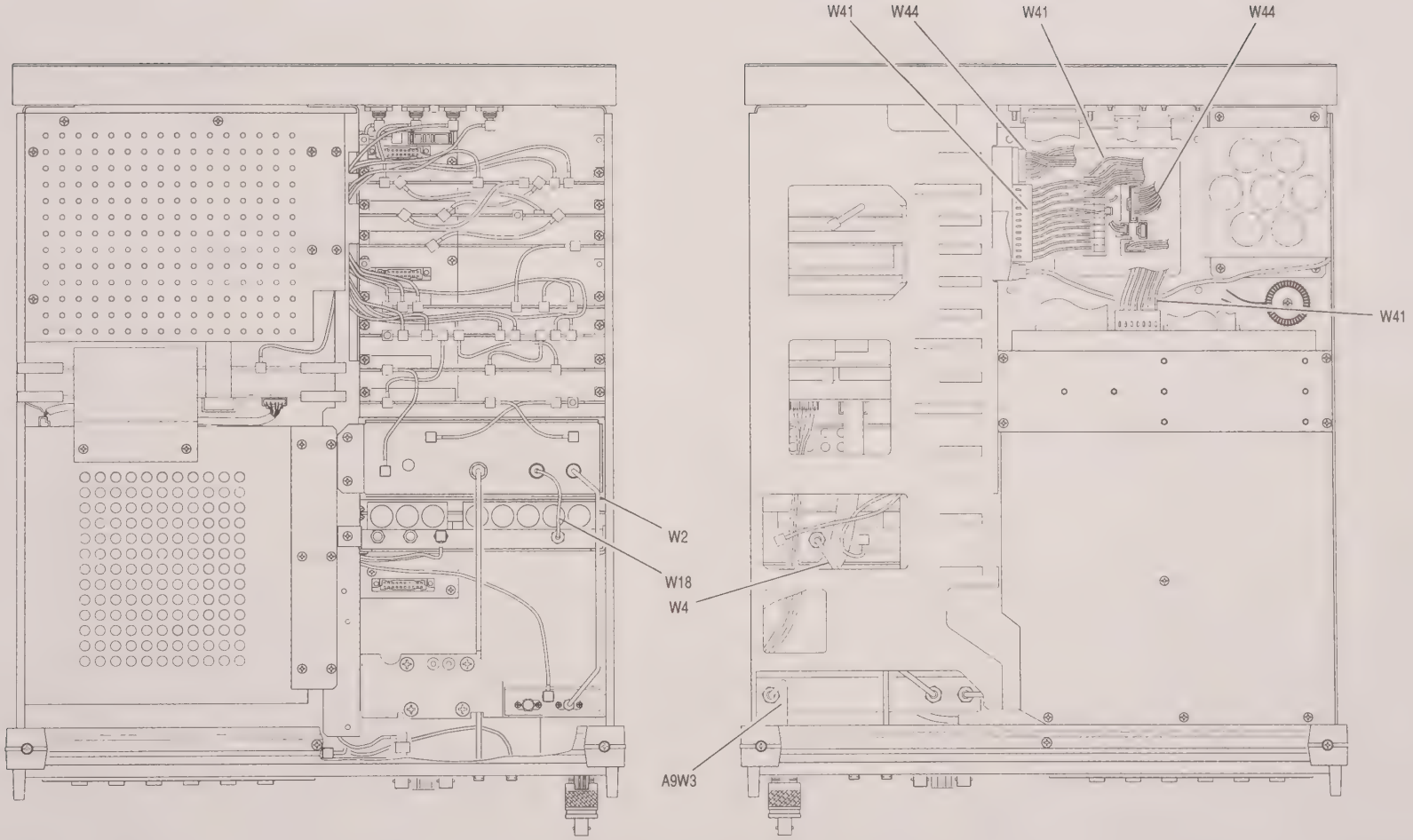


Figure 7-3 AN930 Composite Assembly
(Sheet 4 of 4)

7218033

7-2-3 COMPOSITE ASSEMBLY (7003-7240-000-CB)

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
*29	2803-0250-003	SCREW, 4-40 X 1/4 pfHM
*33	1416-7260-300	HOUSING, FAN EXTERNAL
*34	2840-0000-009	WASHER, FLAT,4,MS15795-803
*38	2506-7258-800	PLATE, COVER, MEMORY CARD
*39	2100-7260-600	BLOCK, POWER SUPPLY MTG
*41	1400-7251-100	BRKT, SPEAKER
*42	1400-7256-300	BRKT, RIGHT CARD GUIDE
*43	2525-7201-100	GASKET, O-RING SEAL DIA .796 *
*46	4104-7253-700	PULL TAB, MEMORY CARD
*47	1400-7264-200	BRKT, PC BOARD RETAINER
*48	2850-0000-008	NUT, HEX, REG PAT, 4-40
*49	2845-0000-012	FINGER STK, TWISTED 1-SIDE SN*
*51	4104-7201-100	CARD GUIDE, NYLON 3" LG *
*52	2803-0188-006	SCREW, 4-40 X 3/16 PPHM
*53	1400-7255-800	BRACKET, LEFT CARD GUIDE
*55	1400-7257-500	BRACKET, COAX MTG
*57	2803-0250-006	SCREW, 4-40 X 1/4 PPHM
*58	2803-0313-006	SCREW, 4-40 X 5/16 PPHM
*59	2803-0438-006	SCREW, 4-40 X 7/16 PPHM
*60	2850-1692-600	SCREW, .340L 35-6.25HH,4-40 X .410
*61	2850-7601-301	SCREW, .188L 4-40.19HH,4-40 X .300
*62	4503-0003-100	RETAINTER, 3" ROUND SPEAKER
*63	6004-0000-001	MOUNT, TY-RAP, PANDUIT ABMS-AC
*66	2405-7251-500	RING, DRESS, SMA CONN
*68	8100-7263-900	FOAM, PAD, MEMORY CARD
*73	2803-0125-006	SCREW, 4-40 X 1/8 PPHM
*74	2840-0000-008	WASHER, FLAT, 4, AN960-C4
*75	2804-0313-006	SCREW, 6-32 X 5/16 PHIL BIND HD
*77	1414-7256-200	COVER, WIRE HARNESS
*78	2803-0500-006	SCREW,4-40 X 1/2 PPHM
*79	2114-9002-001	CONTACT SKT26-22GA.SHF001T855*
*80	6012-0166-100	TUBING, PVC-105, 6 AWG,CLEAR
*81	2510-5064-301	HUB, TRANSFORMER MOUNTING
*82	2840-7600-216	WASHER, PHEN,.630D,.140ID,.060T
*83	2803-0750-003	SCREW, 4-40 X 3/4 pfHM
U1	F000-7210-105	MEMORY CARD EPROM ROM.BINV1.05
A1	6500-7280-500	MINOR ASSY, CHASSIS
A2	7010-7230-000	PCB ASSY, MOTHERBOARD
A3	7011-7241-100	FIRMWARE ASSY, SAMPLER SYNTH
A4	7011-7241-300	FIRMWARE ASSY, FREQ REF
A5	7009-7240-400	COAX KIT, AN930
A6	7110-7200-100	POWER SUPPLY, PURCH CEI, 100W
A7	7005-7242-000	MECH ASSY, CRT
A8	7005-7243-200	MECH ASSY, FAN FILTER
A9	7005-7243-500	MECH ASSY, MICROWAVE RECEIVER
A10	7005-7241-800	MECH ASSY, YIG SYNTHESIZER
A11	7005-7242-200	MECH ASSY, RF RECEIVER

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
A12	7005-7240-300	MECH ASSY, FT PANEL
A13	7011-7245-000	FIRMWARE ASSY, SWEEP SYNTH
A14	7011-7240-700	FIRMWARE ASSY, 410MHZ IF
A15	7010-7231-500	PCB ASSY, IF BANDWIDTH, STD
A16	7011-7245-200	FIRMWARE ASSY, LOG AMP
A17	7011-7240-500	FIRMWARE ASSY, DIGITIZER
A18	7011-7241-200	FIRMWARE ASSY, ANALOG
A19	7011-7241-900	FIRMWARE ASSY, SYSTEM CONTLR
A20	7011-7241-700	FIRMWARE ASSY, VIDEO CONT
AT1	5650-0010-200	TERMINATION, M SMA, 50 OHM,1.15
AT2	5650-0010-200	TERMINATION, M SMA, 50 OHM,1.15
AT3	5650-0010-200	TERMINATION,M SMA,50 OHM,1.15 (NON-OPTION 02)
AT4	2289-7204-100	CAP, 50 OHM TERM SMA/M W/CHAIN
AT5	2289-7204-100	CAP, 50 OHM TERM SMA/M W/CHAIN
B1	2600-0008-000	FAN, 12VDC 3.62 SQ 49.4 CFM
B1W1P1	2115-9002-002	CONN, RECT.098 PLUG2-P.SMP02VB*
J1	2123-0000-074	CONN, BLKHD JACK BNC FT MTG *
J2	2123-0000-074	CONN, BLKHD JACK BNC FT MTG *
J3	2123-0000-074	CONN, BLKHD JACK BNC FT MTG *
J4	2123-0000-074	CONN, BLKHD JACK BNC FT MTG *
LS1	5950-0000-003	SPEAKER, FERRITE, 3 RND, 8 OHM
W2	6042-7281-900	COAX ASSY, .141MICR REC/YIG SYN
W4	6042-7281-800	COAX ASSY, S/R, ATTEN/REC IF
W18	6042-7282-000	COAX ASSY, S/R REC IF/YIG SYNTH
W39	6045-7281-200	RBN CA ASSY, GPIB/RS232
W40	6045-7281-400	RBN CA ASSY, MOTHERBD/REAR PNL
W41	7007-7280-800	WIRE HRN ASSY, POWER SUPPLY
W42	7007-7280-900	WIRE HARNESS ASSY, CRT
W43	7007-7282-400	WIRE HRN ASSY, SPEAKER
W44	7007-7283-000	WIRE HRN ASSY, PWR SUP/MOTHERBD
W45	6045-7281-500	RBN CA ASSY, KEYBOARD CNTRL
W46	6045-7281-300	RBN CA ASSY, MOTHERBD/SYS CNTRL
W47	6045-7281-100	RBN CA ASSY, EXT DISPLAY
A9W3	6042-7280-100	COAX ASSY, S/R, .141 (ANALYZER INPUT CONNECTOR [PART OF MICROWAVE RCVR ASSY])

7-2-4 AN930 COAXIAL KIT (7009-7240-400-A1)

Refer to Figure 6-1 for location of cables.

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
W5	6050-0041-800	COAX ASSY, 316,R F SMB/R F SMB
W6	6050-0652-200	COAX ASSY, 316,STR SMA/RA F SMB
W7	6050-0562-100	COAX ASSY, 316,R M SMA/R F SMB
W8	6050-0042-220	COAX ASSY, 316,R F SMB/R F SMB
W14	6050-0040-350	COAX ASSY, FLEXIBLE,RG 316/U
W15	6050-0561-500	COAX ASSY, 316,R M SMA,R F SMB
W16	6050-0041-800	COAX ASSY, 316,R F SMB/R F SMB
W17	6050-0561-650	COAX ASSY, 316,R M SMA/R F SMB
W19	6050-0040-300	COAX ASSY, 316,R F SMB/R F SMB
W20	6050-0560-300	COAX ASSY, 316,R M SMA/R F SMB
W21	6050-0041-220	COAX ASSY, 316,R F SMB/R F SMB
W23	6050-0040-250	COAX ASSY, FLEXIBLE,RG 316/U
W24	6050-0040-870	COAX ASSY, 316,R F SMB/R F SMB
W25	6050-0040-200	COAX ASSY, 316,R F SMB/R F SMB
W26	6050-0040-300	COAX ASSY, 316,R F SMB/R F SMB
W27	6050-0041-420	RG 316/U FLEX COAX ASSY
W28	6050-0040-400	COAX ASSY, 316,R F SMB/R F SMB
W30	6050-0040-400	COAX ASSY, 316,R F SMB/R F SMB
W31	6050-0040-400	COAX ASSY, 316,R F SMB/R F SMB
W32	6050-0040-300	COAX ASSY, 316,R F SMB/R F SMB
W33	6050-0040-870	COAX ASSY, 316,R F SMB/R F SMB
W34	6050-0040-600	COAX ASSY, 316,R F SMB/R F SMB
W35	6050-0041-220	COAX ASSY, 316,R F SMB/R F SMB
W36	6050-0040-300	COAX ASSY, 316,R F SMB/R F SMB
W37	6050-0040-250	COAX ASSY, FLEXIBLE,RG 316/U

7-3 PARTS LISTING OF AN920 ASSEMBLIES

Prefix all reference designators with 02A1.

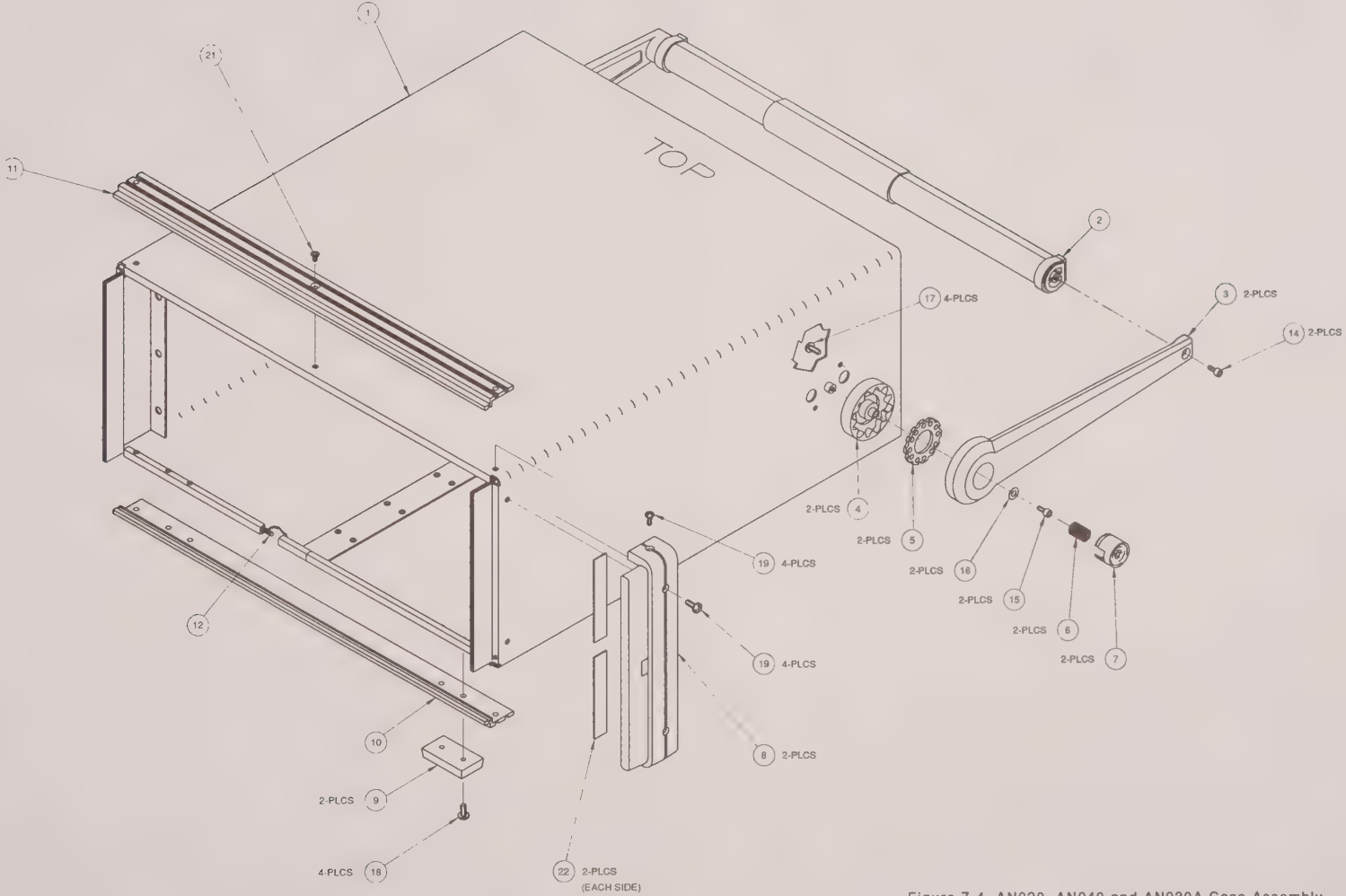


Figure 7-4 AN920, AN940 and AN930A Case Assembly

7218038

7-3-1 CASE ASSEMBLY (7005-7246-700-A1)

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
*01	1412-7276-300	CASE, AN930A (AN920, AN940)
*02	1407-7270-303	HANDLE, MOLDED GRIP 15.25 LG
*03	1407-7270-000	HANDLE, 8.5" TILT BAIL
*04	2510-7270-100	HUB, TILT BAIL HANDLE INNER
*05	2808-7270-200	DISC, HANDLE INDEXING
*06	2106-0000-012	CMPRSN SPR.36 OD*.50 FREE LGTH
*07	2402-7270-500	PUSHBUTTON, TILT BAIL HANDLE
*08	1421-7270-900	FOOT, MOLDED CASE
*09	1421-7204-000	FOOT, MOLDED PLASTIC RECT,BLK*
*10	2400-7278-700	TRIM,BOTTOM CASE, AN930 (AN920, AN940, AN930A)
*11	2400-7278-600	TRIM, TOP, CASE, AN930A (AN920, AN940)
*12	2525-0010-000	GASKET, ROPE,.188OD,BER COPPER*
*14	2805-0500-002	SCREW, 8-32 1/2 SHCS BLACK
*15	2804-0625-002	SCREW, 6-32X5/8 SHCSSS
*16	2840-0000-024	WASHER, FLAT,ID.160OD.375TK.032
*17	2804-0250-006	SCREW,6-32 X 1/4 PPHM
*18	2804-0375-008	SCREW, #6-32X3/8 PHMS BLACK
*19	2804-0188-008	SCREW, #6-32X3/16 PHMS BLACK
*21	2804-0250-010	SCREW, 6-32X1/4 PFH BLK OX SS
*22	1050-0000-285	TAPE, SCOTCH VHB 1/2" WIDE

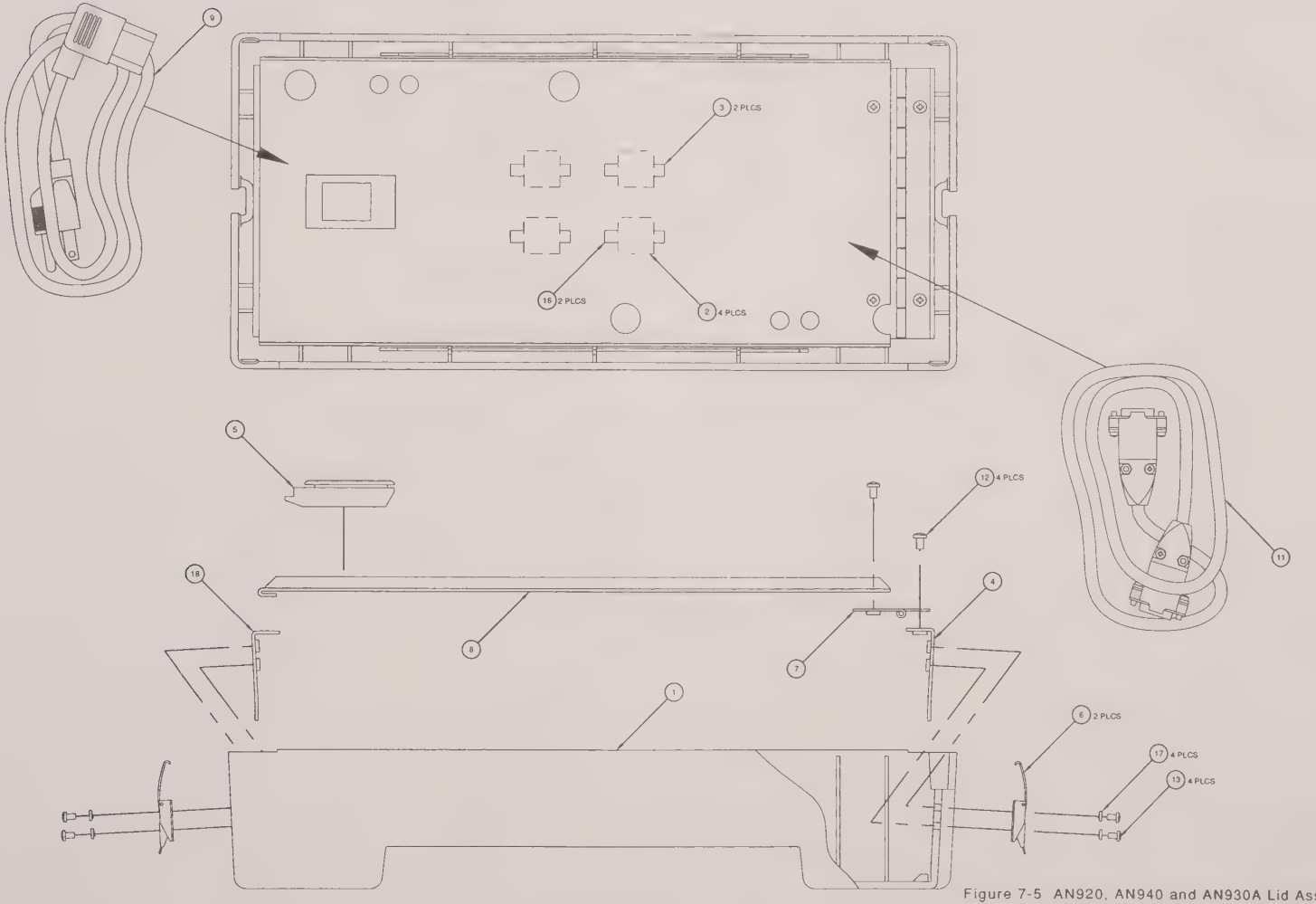


Figure 7-5 AN920, AN940 and AN930A Lid Assembly 7218037

7-3-2 LID ASSEMBLY (7005-7247-800-A1)

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
*01	1414-7270-700	COVER, FRONT MOLDED
*02	2111-0000-002	CLIP, COMPONENT,ADHESIVE,.25DIA
*03	5106-0000-038	FUSE, 1.25,GL,FAST,250V,5 A (110 V UNIT)
*04	1400-7264-500	BRKT, SIDE BATTERY PACK
*05	2850-0000-109	LATCH, SLIDE-LATCH
*06	2832-0001-007	LATCH, OVER-CENTER DRAW SS
*07	2832-7264-900	HINGE, FRONT COVER
*08	1405-7279-000	PANEL, FRONT COVER
*09	6041-0001-001	CABLE ASSY,IEC R.A,BELD 17545
*11	6041-9001-100	CABLE SHIELDED RS-232C, 6FT
*12	2804-0250-006	SCREW, 6-32 X 1/4 PPHM
*13	2803-0250-006	SCREW, 4-40 X 1/4 PPHM
*16	5106-4402-500	FUSE, 1.25,GL,FAST,250V,2.5 A (220 V UNIT)
*17	2840-0000-012	WASHER, LOCK,4 SPLIT SS
*18	1400-7263-600	BRACKET, FRONT COVER

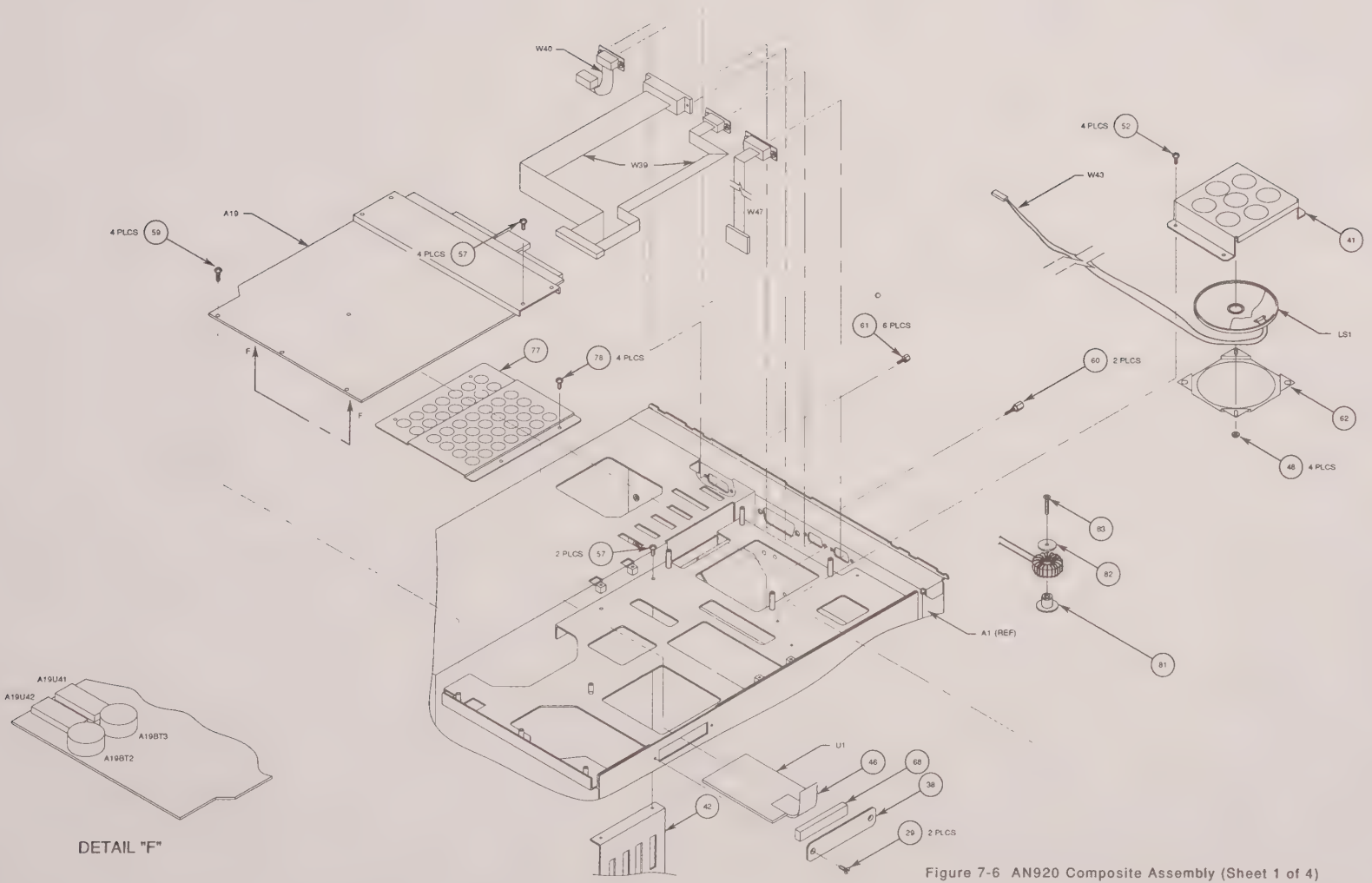


Figure 7-6 AN920 Composite Assembly (Sheet 1 of 4)

0218002

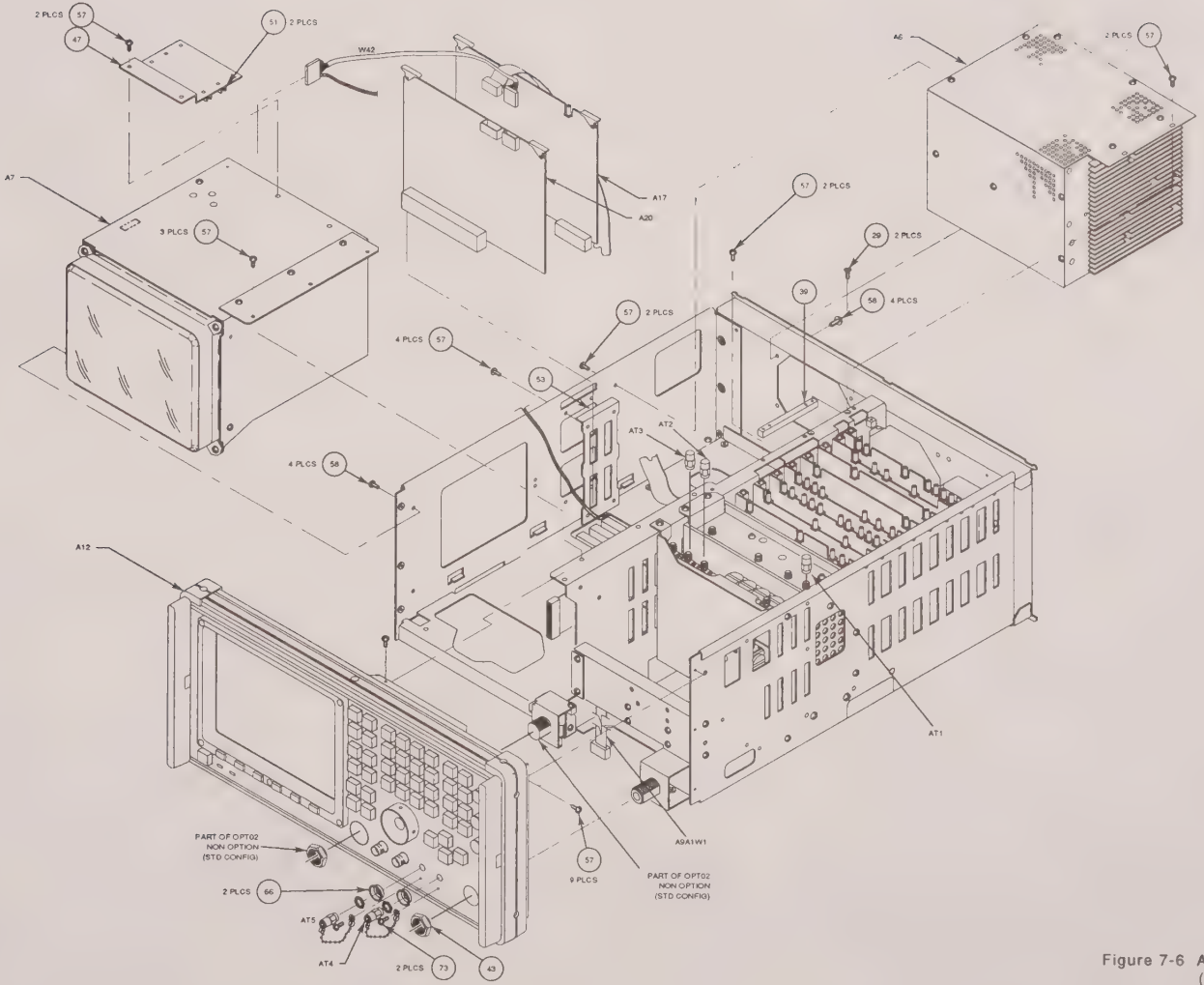


Figure 7-6 AN920 Composite Assembly (Sheet 2 of 4)

0218003

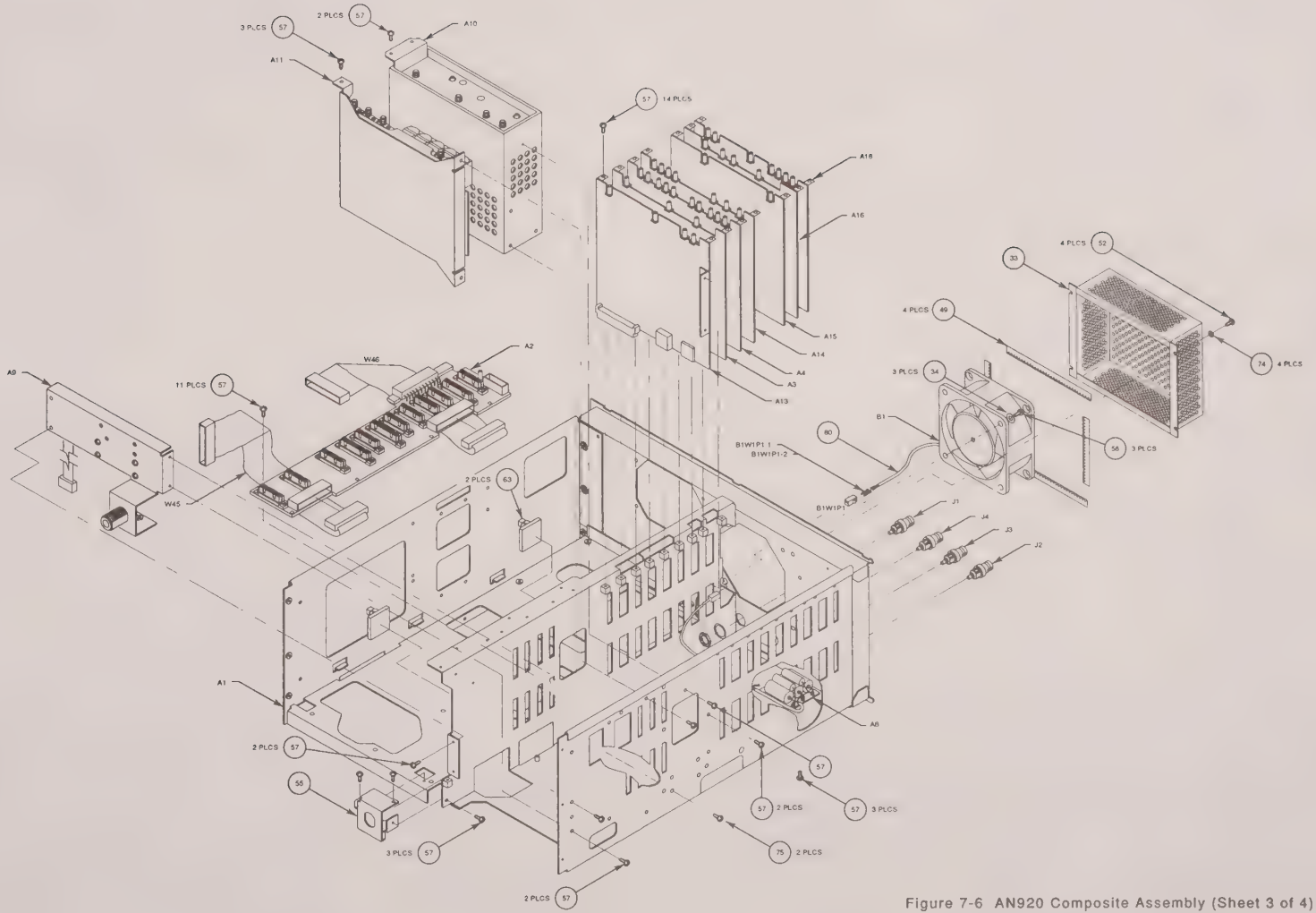


Figure 7-6 AN920 Composite Assembly (Sheet 3 of 4)

0218004

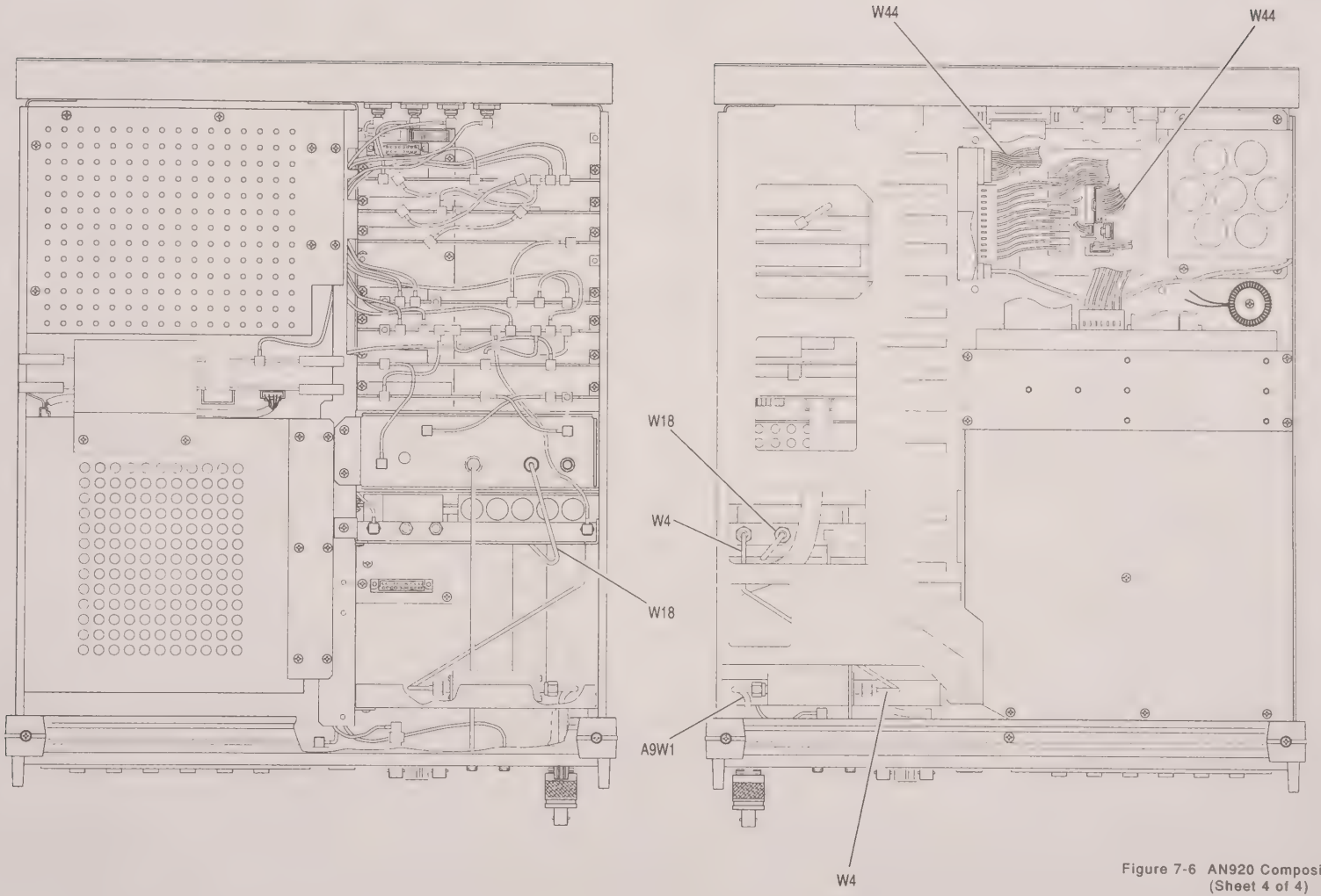


Figure 7-6 AN920 Composite Assembly
(Sheet 4 of 4)

0218005

7-3-3 COMPOSITE ASSEMBLY (7003-0240-000-A1)

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
*29	2803-0250-003	SCREW, 4-40 X 1/4 PFHM
*33	1416-7260-300	HOUSING, FAN EXTERNAL
*34	2840-0000-009	WASHER, FLAT,4,MS15795-803
*38	2506-7258-800	PLATE, COVER, MEMORY CARD
*39	2100-7260-600	BLOCK, POWER SUPPLY MTG
*41	1400-7251-100	BRKT, SPEAKER
*42	1400-7256-300	BRKT, RIGHT CARD GUIDE
*43	2850-8757-200	NUT, N CONN SPACER T/R PORT
*46	4104-7253-700	PULL TAB, MEMORY CARD
*47	1400-7264-200	BRKT, PC BOARD RETAINER
*48	2850-0000-008	NUT,HEX,REG PAT,4-40
*49	2845-0000-012	FINGER STK, TWISTED 1-SIDE SN*
*51	4104-7201-100	CARD GUIDE, NYLON, 3" LG *
*52	2803-0188-006	SCREW, 4-40 X 3/16 PPHM
*53	1400-7255-800	BRACKET, LEFT CARD GUIDE
*55	1400-7274-100	BRACKET, COAX MTG
*57	2803-0250-006	SCREW, 4-40 X 1/4 PPHM
*58	2803-0313-006	SCREW, 4-40 X 5/16 PPHM
*59	2803-0438-006	SCREW, 4-40 X 7/16 PPHM
*60	2850-1692-600	SCREW,.340L35-6.25HH,4-40X.410
*61	2850-7601-301	SCREW,.188L4-40.19HH,4-40X.300
*62	4503-0003-100	RETAINTER, 3" ROUND SPEAKER
*63	6004-0000-001	MOUNT, TY-RAP,PANDUIT ABMS-AC
*66	2405-7251-500	RING, DRESS, SMA CONN
*68	8100-7263-900	FOAM, PAD, MEMORY CARD
*73	2803-0125-006	SCREW, 4-40 X 1/8 PPHM
*74	2840-0000-008	WASHER, FLAT,4,AN960-C4
*75	2804-0313-006	SCREW, 6-32X5/16 PHIL BIND HD
*77	1414-7256-200	COVER, WIRE HARNESS
*78	2803-0500-006	SCREW, 4-40 X 1/2 PPHM
*80	6012-0166-100	TUBING, PVC-105, 6 AWG,CLEAR
*81	2510-5064-301	HUB, TRANSFORMER MOUNTING
*82	2840-7600-216	WASHER, PHEN,.63OD,.140ID,.060T
*83	2803-0750-003	SCREW, 4-40 X 3/4 PFHM
U1	F000-0210-100	920 SYS SW FLASH ROM.BIN V1.00
A1	6500-7276-500	MINOR ASSY, CHASSIS
A2	7010-7236-300	PCB ASSY, MOTHERBOARD
A3	7011-7241-100	FIRMWARE ASSY, SAMPLER SYNTH
A4	7011-7241-300	FIRMWARE ASSY, FREQ REF
A5	7009-0240-000	COAX KIT, AN920
A6	7110-7200-100	POWER,SUPPLY,PURCH CEI 100W
A7	7005-7242-000	MECH ASSY, CRT
A8	7005-7243-200	MECH ASSY, FAN FILTER
A9	7005-7247-600	MECH ASSY, ATTEN, AN920
A10	7005-7241-800	MECH ASSY, YIG SYNTHESIZER
A11	7005-7244-800	MECH ASSY, RF RECEIVER
A12	7005-7246-600	MECH ASSY, FRONT PANEL AN920

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
A13	7011-7245-000	FIRMWARE ASSY, SWEEP SYNTH
A14	7011-7246-500	FIRMWARE ASSY, 410MHZ IF
A15	7010-7231-500	PCB ASSY, IF BANDWIDTH, STD
A16	7011-7245-600	FIRMWARE ASSY, LOG AMP
A17	7011-7240-500	FIRMWARE ASSY, DIGITIZER
A18	7011-7246-400	FIRMWARE ASSY, ANALOG
A19	7011-7241-900	FIRMWARE ASSY, SYSTEM CONTLR
A20	7011-7241-700	FIRMWARE ASSY, VIDEO CONT
AT1	5650-0010-200	TERMINATION,M SMA,50 OHM,1.15
AT2	5650-0010-200	TERMINATION,M SMA,50 OHM,1.15
AT3	5650-0010-200	TERMINATION,M SMA,50 OHM,1.15 (NON-OPTION 02)
AT4	2289-7204-100	CAP, 50 OHM TERM SMA/M W/CHAIN
AT5	2289-7204-100	CAP, 50 OHM TERM SMA/M W/CHAIN
B1	2600-0008-000	FAN, 12VDC 3.62 SQ 49.4 CFM
B1W1P1	2115-9002-002	CONN, RECT.098 PLUG2-P.SMP02VB
B1W1P1-1	2114-9002-001	CONTACT SKT26-22GA.SHF001T855
B1W1P1-2	2114-9002-001	CONTACT SKT26-22GA.SHF001T855
A19BT2	4000-0010-000	BTRY, LITHUM MEM BACK-UP
A19BT3	4000-0010-000	BTRY, LITHUM MEM BACK-UP
J1	2123-0000-074	CONN, BLKHD JACK BNC FT MTG
J2	2123-0000-074	CONN, BLKHD JACK BNC FT MTG
J3	2123-0000-074	CONN, BLKHD JACK BNC FT MTG
J4	2123-0000-074	CONN, BLKHD JACK BNC FT MTG
LS1	5950-0000-003	SPEAKER, FERRITE, 3 RND, 8 OHM
A19U41	3260-1005-001	IC, CMOS RAM 128X8 BIT 100NS
A19U42	3260-1005-001	IC, CMOS RAM 128X8 BIT 100NS
W4	6042-7285-200	COAX ASSY, ATTEN/REC IF
W18	6042-7285-900	COAX ASSY,.086 YIG SYN/REC IF
W39	6045-7281-200	RBN CA ASSY, GPIB/RS232
W40	6045-7281-400	RBN CA ASSY, MOTHERBD/REAR PNL
W41	7007-7280-800	WIRE HRN ASSY, POWER SUPPLY
W42	7007-7280-900	WIRE HARNESS ASSY, CRT
W43	7007-7282-400	WIRE HRN ASSY, SPEAKER
W44	7007-7283-000	WIRE HRN ASSY, PWR SUP/MOTHERBD
W45	6045-7281-500	RBN CA ASSY, KEYBOARD CNTRL
W46	6045-7281-300	RBN CA ASSY, MOTHERBD/SYS CNTRL
W47	6045-7281-100	RBN CA ASSY, EXT DISPLAY
A9W1	6042-7285-000	COAX ASSY, FP/ATTEN, AN920 (ANALYZER INPUT CONNECTOR [PART OF ATTENUATOR ASSY])

7-3-4 AN920 COAXIAL KIT (7009-0240-000-A)

Refer to Figure 6-1 for location of cables.

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
W6	6050-0652-200	COAX ASSY,316,STR SMA/RA F SMB
W7	6050-0562-100	COAX ASSY,316,R M SMA/R F SMB
W8	6050-0042-220	COAX ASSY,316,R F SMB/R F SMB
W14	6050-0040-350	COAX ASSY,FLEXIBLE,RG 316/U
W15	6050-0561-500	COAX ASSY,316,R M SMA,R F SMB
W16	6050-0560-900	COAX ASSY,316,R M SMA/R F SMB
W17	6050-0561-650	COAX ASSY,316,R M SMA/R F SMB
W19	6050-0040-300	COAX ASSY,316,R F SMB/R F SMB
W20	6050-0560-300	COAX ASSY,316,R M SMA/R F SMB
W21	6050-0041-220	COAX ASSY,316,R F SMB/R F SMB
W23	6050-0040-250	COAX ASSY,FLEXIBLE,RG 316/U
W24	6050-0040-870	COAX ASSY,316,R F SMB/R F SMB
W25	6050-0040-200	COAX ASSY,316,R F SMB/R F SMB
W26	6050-0040-300	COAX ASSY,316,R F SMB/R F SMB
W27	6050-0041-420	RG 316/U FLEX COAX ASSY
W28	6050-0040-400	COAX ASSY,316,R F SMB/R F SMB
W30	6050-0040-400	COAX ASSY,316,R F SMB/R F SMB
W31	6050-0040-400	COAX ASSY,316,R F SMB/R F SMB
W32	6050-0040-300	COAX ASSY,316,R F SMB/R F SMB
W33	6050-0040-870	COAX ASSY,316,R F SMB/R F SMB
W34	6050-0040-600	COAX ASSY,316,R F SMB/R F SMB
W35	6050-0041-220	COAX ASSY,316,R F SMB/R F SMB
W36	6050-0040-300	COAX ASSY,316,R F SMB/R F SMB
W37	6050-0040-250	COAX ASSY,FLEXIBLE,RG 316/U

7-4 PARTS LISTING OF AN940 ASSEMBLIES

Prefix all reference designators with 04A1.

7-4-1 CASE ASSEMBLY (7005-7246-700-A1)

Refer to 7-3-1.

7-4-2 LID ASSEMBLY (7005-7247-800-A1)

Refer to 7-3-2.

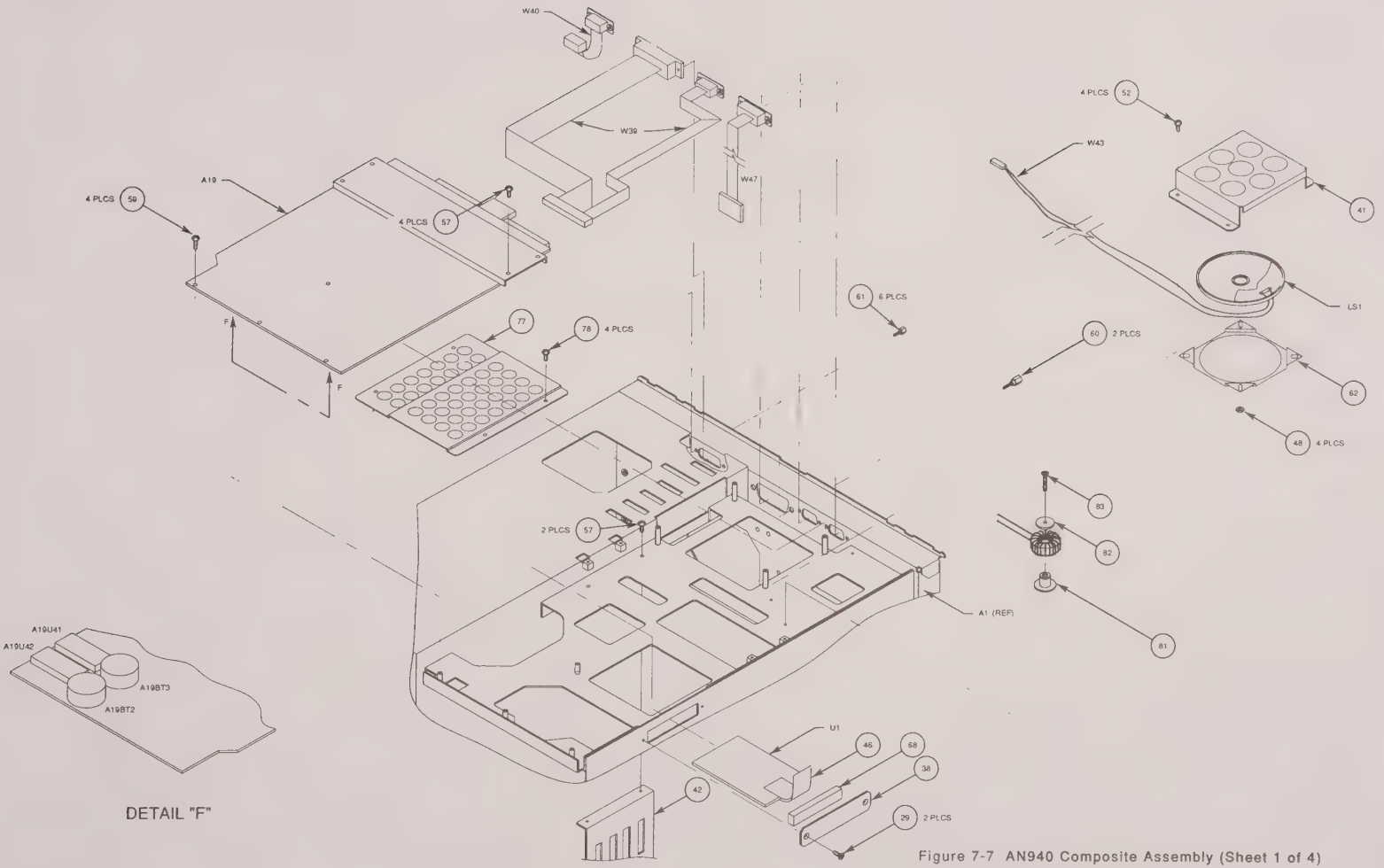


Figure 7-7 AN940 Composite Assembly (Sheet 1 of 4)

0418002

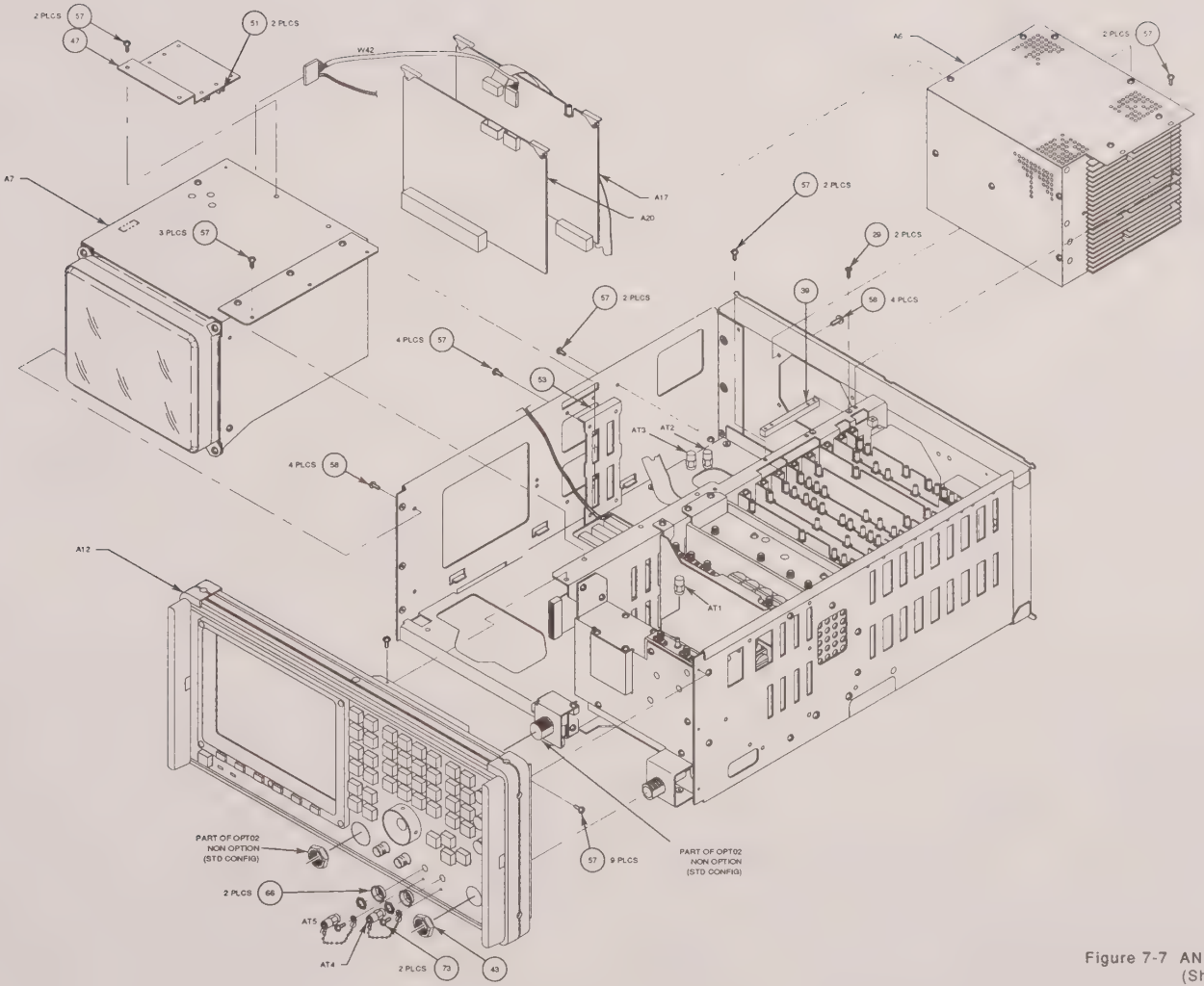


Figure 7-7 AN940 Composite Assembly
(Sheet 2 of 4)

0418003

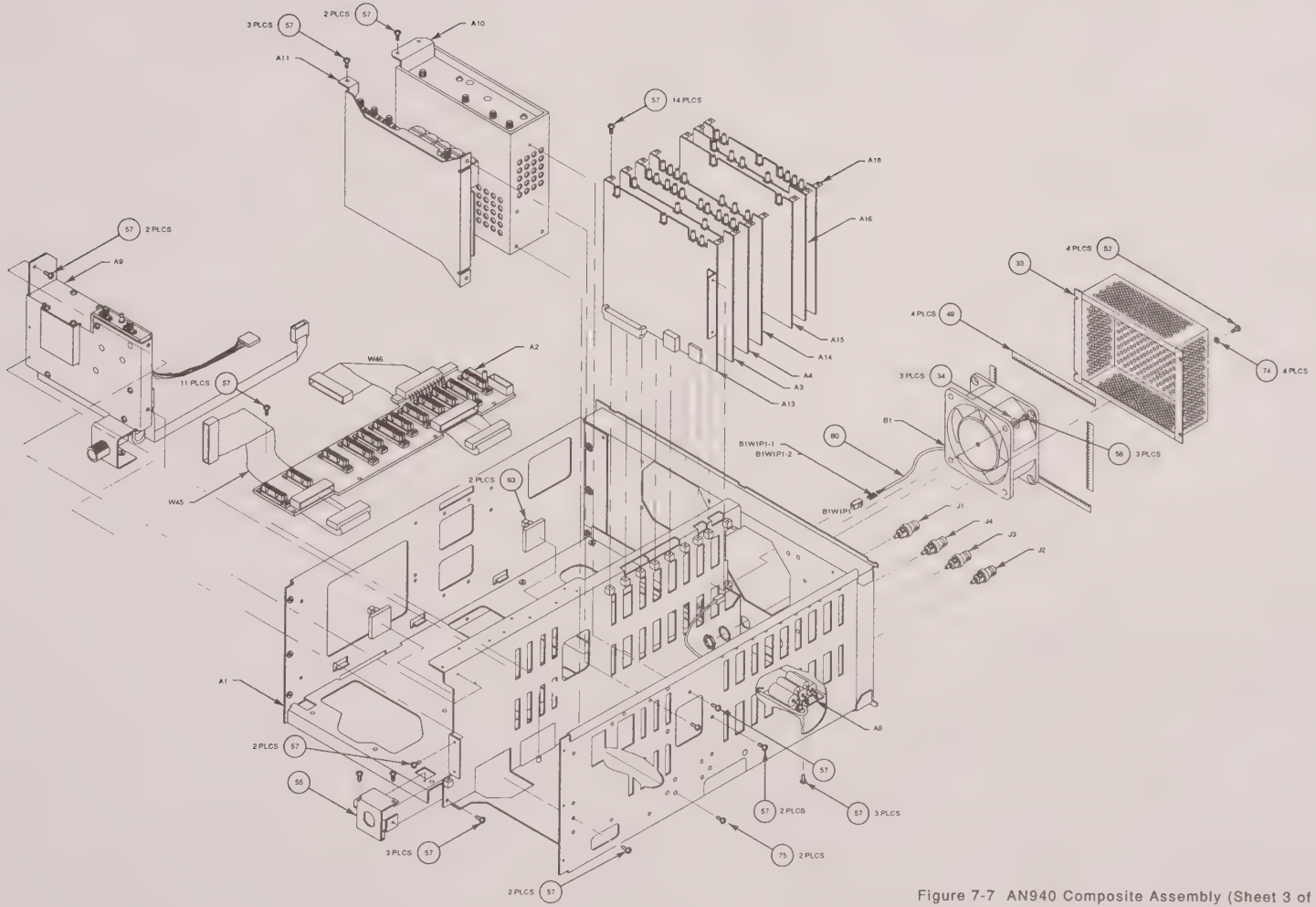


Figure 7-7 AN940 Composite Assembly (Sheet 3 of 4)

0418004

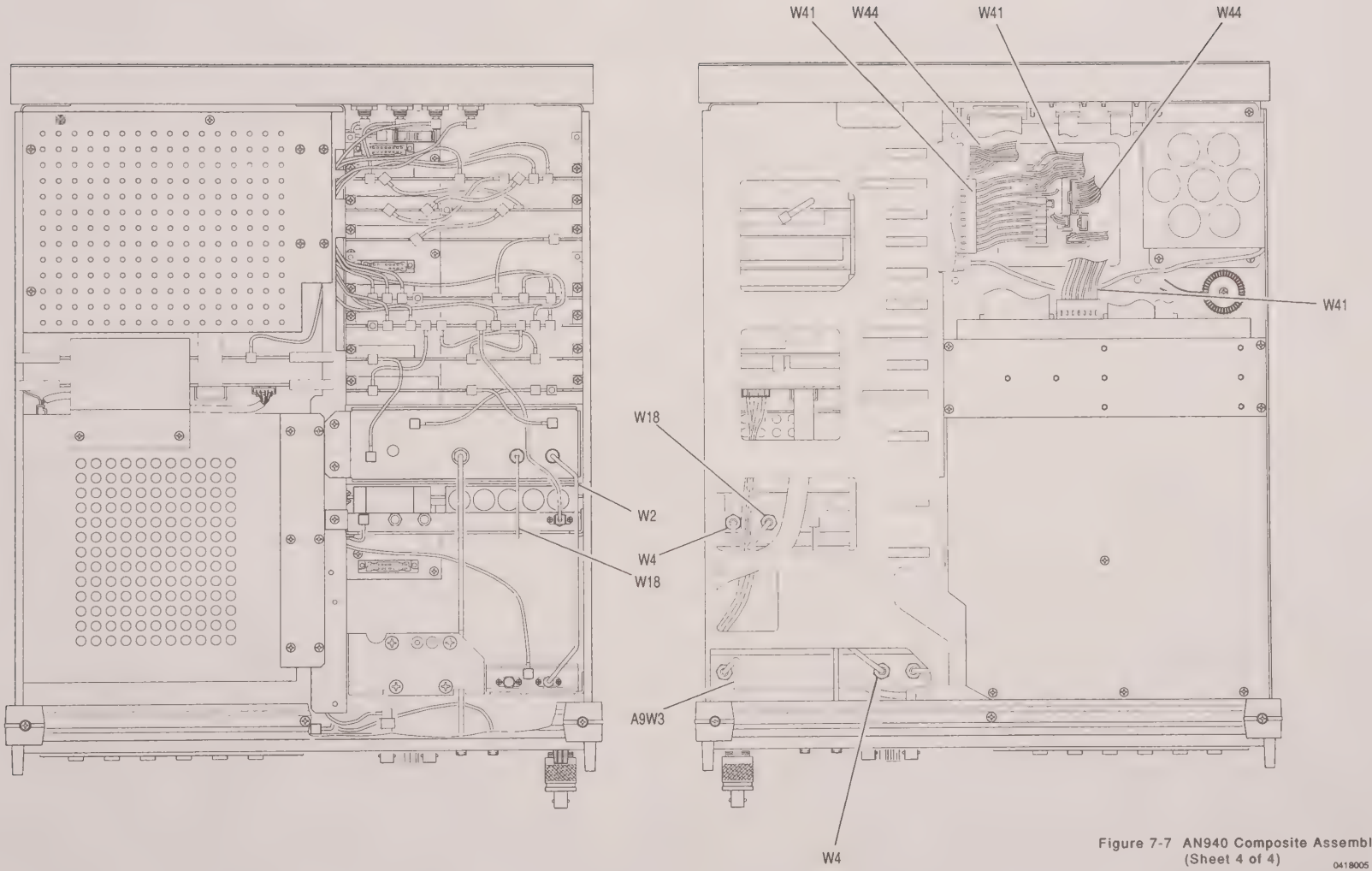


Figure 7-7 AN940 Composite Assembly
(Sheet 4 of 4)

0418005

7-4-3 COMPOSITE ASSEMBLY (7003-0440-000-A1)

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
	2200-7201-500	CONN, PLANAR CROWN, 3.5MM F *
*29	2803-0250-003	SCREW, 4-40 X 1/4 PFHM
*33	1416-7260-300	HOUSING, FAN EXTERNAL
*34	2840-0000-009	WASHER, FLAT,4,MS15795-803
*38	2506-7258-800	PLATE, COVER, MEMORY CARD
*39	2100-7260-600	BLOCK, POWER SUPPLY MTG
*41	1400-7251-100	BRKT, SPEAKER
*42	1400-7256-300	BRKT, RIGHT CARD GUIDE
*43	2850-8757-200	NUT, N CONN SPACER T/R PORT
*46	4104-7253-700	PULL TAB, MEMORY CARD
*47	1400-7264-200	BRKT, PC BOARD RETAINER
*48	2850-0000-008	NUT, HEX,REG PAT,4-40
*49	2845-0000-012	FINGER STK, TWISTED 1-SIDE SN*
*51	4104-7201-100	CARD GUIDE, NYLON 3" LG *
*52	2803-0188-006	SCREW, 4-40 X 3/16 PPHM
*53	1400-7255-800	BRACKET, LEFT CARD GUIDE
*55	1400-7274-100	BRACKET, COAX MTG
*57	2803-0250-006	SCREW, 4-40 X 1/4 PPHM
*58	2803-0313-006	SCREW, 4-40 X 5/16 PPHM
*59	2803-0438-006	SCREW, 4-40 X 7/16 PPHM
*60	2850-1692-600	SCREW, .340L35-6.25HH,4-40X.410
*61	2850-7601-301	SCREW, .188L4-40.19HH,4-40X.300
*62	4503-0003-100	RETAINTER, 3" ROUND SPEAKER
*63	6004-0000-001	MOUNT, TY-RAP,PANDUIT ABMS-AC
*66	2405-7251-500	RING, DRESS, SMA CONN
*68	8100-7263-900	FOAM, PAD, MEMORY CARD
*73	2803-0125-006	SCREW, 4-40 X 1/8 PPHM
*74	2840-0000-008	WASHER, FLAT,4,AN960-C4
*75	2804-0313-006	SCREW, 6-32X5/16 PHIL BIND HD
*77	1414-7256-200	COVER, WIRE HARNESS
*78	2803-0500-006	SCREW, 4-40 X 1/2 PPHM
*80	6012-0166-100	TUBING, PVC-105, 6 AWG,CLEAR
*81	2510-5064-301	HUB, TRANSFORMER MOUNTING
*82	2840-7600-216	WASHER, PHEN,.63OD,.140ID,.060T
*83	2803-0750-003	SCREW, 4-40 X 3/4 PFHM
U1	F000-0410-100	940 SYS SW FLASH ROM.BIN V1.00
A1	6500-7276-500	MINOR ASSY, CHASSIS
A2	7010-7236-300	PCB ASSY, MOTHERBOARD
A3	7011-7241-100	FIRMWARE ASSY, SAMPLER SYNTH
A4	7011-7241-300	FIRMWARE ASSY, FREQ REF
A5	7009-7248-300	COAX KIT, AN930A/940
A6	7110-7200-100	POWER, SUPPLY,PURCH CEI 100W
A7	7005-7243-200	MECH ASSY, FAN FILTER
A8	7005-7244-800	MECH ASSY, RF RECEIVER
A9	7005-7247-700	MECH ASSY, MICROWAVE RECEIVER
A10	7005-7242-000	MECH ASSY, CRT
A11	7005-7246-100	MECH ASSY, YIG SYNTHESIZER

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
A12	7005-7247-300	MECH ASSY, FRONT PANEL, AN940
A13	7011-7245-000	FIRMWARE ASSY, SWEEP SYNTH
A14	7011-7246-500	FIRMWARE ASSY, 410MHZ IF
A15	7010-7231-500	PCB ASSY, IF BANDWIDTH, STD
A16	7011-7245-600	FIRMWARE ASSY, LOG AMP
A17	7011-7240-500	FIRMWARE ASSY, DIGITIZER
A18	7011-7246-400	FIRMWARE ASSY, ANALOG
A19	7011-7241-900	FIRMWARE ASSY, SYSTEM CONTLR
A20	7011-7241-700	FIRMWARE ASSY, VIDEO CONT
AT1	5650-0010-200	TERMINATION, M SMA,50 OHM,1.15
AT2	5650-0010-200	TERMINATION, M SMA,50 OHM,1.15
AT3	5650-0010-200	TERMINATION,M SMA,50 OHM,1.15 (NON-OPTION 02)
AT4	2289-7204-100	CAP, 50 OHM TERM SMA/M W/CHAIN
AT5	2289-7204-100	CAP, 50 OHM TERM SMA/M W/CHAIN
B1	2600-0008-000	FAN, 12VDC 3.62 SQ 49.4 CFM
B1W1P1	2115-9002-002	CONN, RECT.098 PLUG2-P.SMP02VB*
B1W1P1-1	2114-9002-001	CONTACT SKT26-22GA.SHF001T855*
B1W1P1-2	2114-9002-001	CONTACT SKT26-22GA.SHF001T855*
A19BT2	4000-0010-000	BTRY, LITHUM MEM BACK-UP *
A19BT3	4000-0010-000	BTRY, LITHUM MEM BACK-UP *
J1	2123-0000-074	CONN, BLKHD JACK BNC FT MTG *
J2	2123-0000-074	CONN, BLKHD JACK BNC FT MTG *
J3	2123-0000-074	CONN, BLKHD JACK BNC FT MTG *
J4	2123-0000-074	CONN, BLKHD JACK BNC FT MTG *
LS1	5950-0000-003	SPEAKER, FERRITE, 3 RND, 8 OHM
A19U41	3260-1005-001	IC, CMOS RAM 128X8 BIT 100NS *
A19U42	3260-1005-001	IC, CMOS RAM 128X8 BIT 100NS *
W2	6042-7281-900	COAX ASSY, .141MICR REC/YIG SYN
W4	6042-7285-100	COAX ASSY, ATTEN/REC IF
W18	6042-7285-900	COAX ASSY, .086 YIG SYN/REC IF
W39	6045-7281-200	RBN CA ASSY, GPIB/RS232
W40	6045-7281-400	RBN CA ASSY, MOTHERBD/REAR PNL
W41	7007-7280-800	WIRE HRN ASSY, POWER SUPPLY
W42	7007-7280-900	WIRE HARNESS ASSY, CRT
W43	7007-7282-400	WIRE HRN ASSY, SPEAKER
W44	7007-7283-000	WIRE HRN ASSY,PWR SUP/MOTHERBD
W45	6045-7281-500	RBN CA ASSY, KEYBOARD CNTRL
W46	6045-7281-300	RBN CA ASSY, MOTHERBD/SYS CNTRL
W47	6045-7281-100	RBN CA ASSY, EXT DISPLAY
A9W3	6042-7285-700	COAX ASSY, FP INPUT ATTEN (ANALYZER INPUT CONNECTOR [PART OF MICROWAVE RCVR ASSY])

7-4-4 AN930A/AN940 COAXIAL KIT (7009-7248-300)

Refer to Figure 6-1 for location of cables.

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
W5	6050-0041-800	COAX ASSY, 316,R F SMB/R F SMB
W6	6050-0652-200	COAX ASSY, 316,STR SMA/RA F SMB
W7	6050-0562-100	COAX ASSY, 316,R M SMA/R F SMB
W8	6050-0042-220	COAX ASSY, 316,R F SMB/R F SMB
W14	6050-0040-350	COAX ASSY, FLEXIBLE,RG 316/U
W15	6050-0561-500	COAX ASSY, 316,R M SMA,R F SMB
W16	6050-0560-900	COAX ASSY, 316,R M SMA/R F SMB
W17	6050-0561-650	COAX ASSY, 316,R M SMA/R F SMB
W19	6050-0040-300	COAX ASSY, 316,R F SMB/R F SMB
W20	6050-0560-300	COAX ASSY, 316,R M SMA/R F SMB
W21	6050-0041-220	COAX ASSY, 316,R F SMB/R F SMB
W23	6050-0040-250	COAX ASSY, FLEXIBLE,RG 316/U
W24	6050-0040-870	COAX ASSY, 316,R F SMB/R F SMB
W25	6050-0040-200	COAX ASSY, 316,R F SMB/R F SMB
W26	6050-0040-300	COAX ASSY, 316,R F SMB/R F SMB
W27	6050-0041-420	RG 316/U FLEX COAX ASSY
W28	6050-0040-400	COAX ASSY, 316,R F SMB/R F SMB
W30	6050-0040-400	COAX ASSY, 316,R F SMB/R F SMB
W31	6050-0040-400	COAX ASSY, 316,R F SMB/R F SMB
W32	6050-0040-300	COAX ASSY, 316,R F SMB/R F SMB
W33	6050-0040-870	COAX ASSY, 316,R F SMB/R F SMB
W34	6050-0040-600	COAX ASSY, 316,R F SMB/R F SMB
W35	6050-0041-220	COAX ASSY, 316,R F SMB/R F SMB
W36	6050-0040-300	COAX ASSY, 316,R F SMB/R F SMB
W37	6050-0040-250	COAX ASSY, FLEXIBLE,RG 316/U

7-5 PARTS LISTING OF AN930A ASSEMBLIES

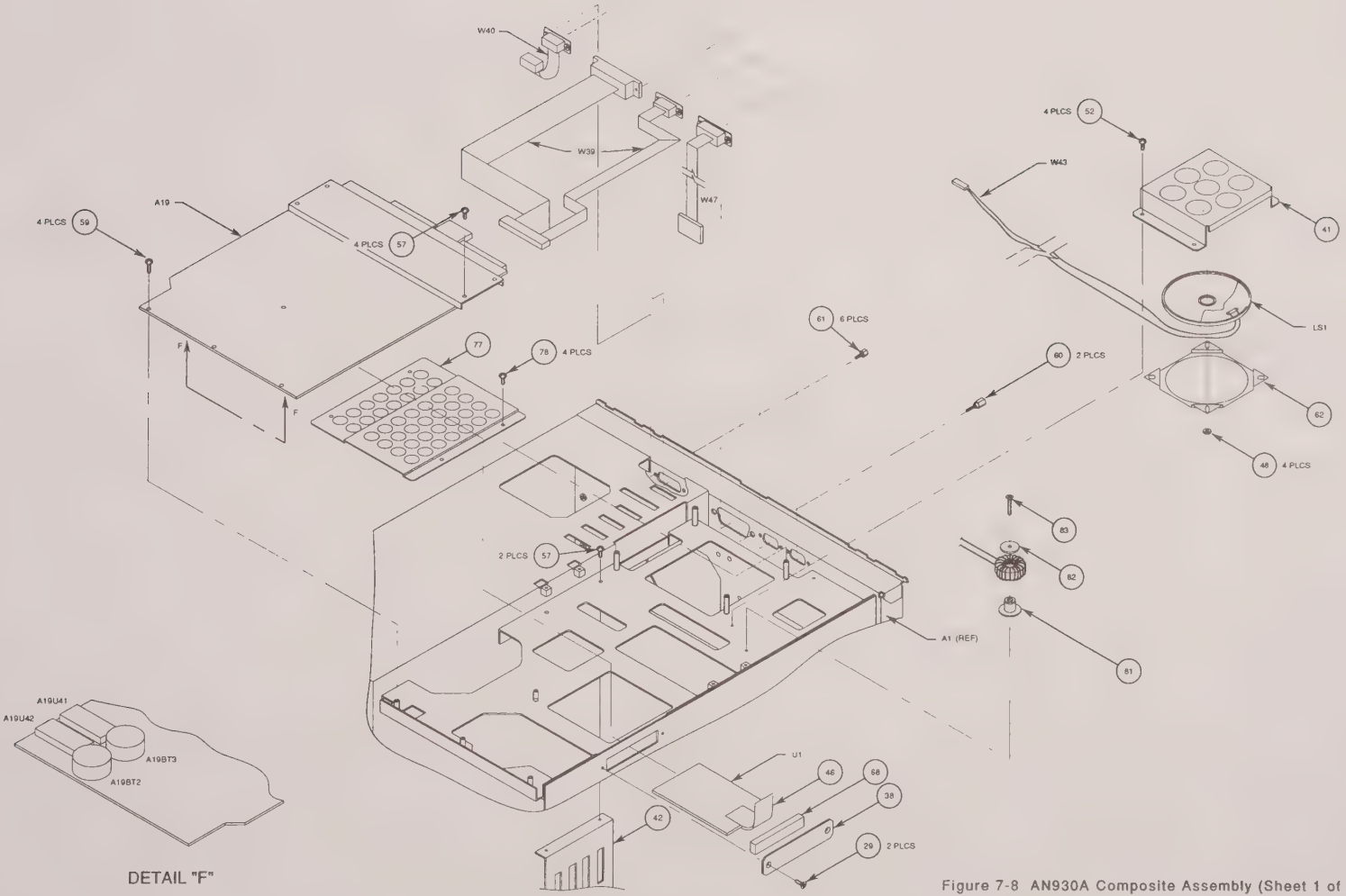
Prefix all reference designators with 03A1.

7-5-1 CASE ASSEMBLY (7005-7246-700-A1)

Refer to 7-3-1.

7-5-2 LID ASSEMBLY (7005-7247-800-A1)

Refer to 7-3-2.



DETAIL "F"

Figure 7-8 AN930A Composite Assembly (Sheet 1 of 4)

0318002

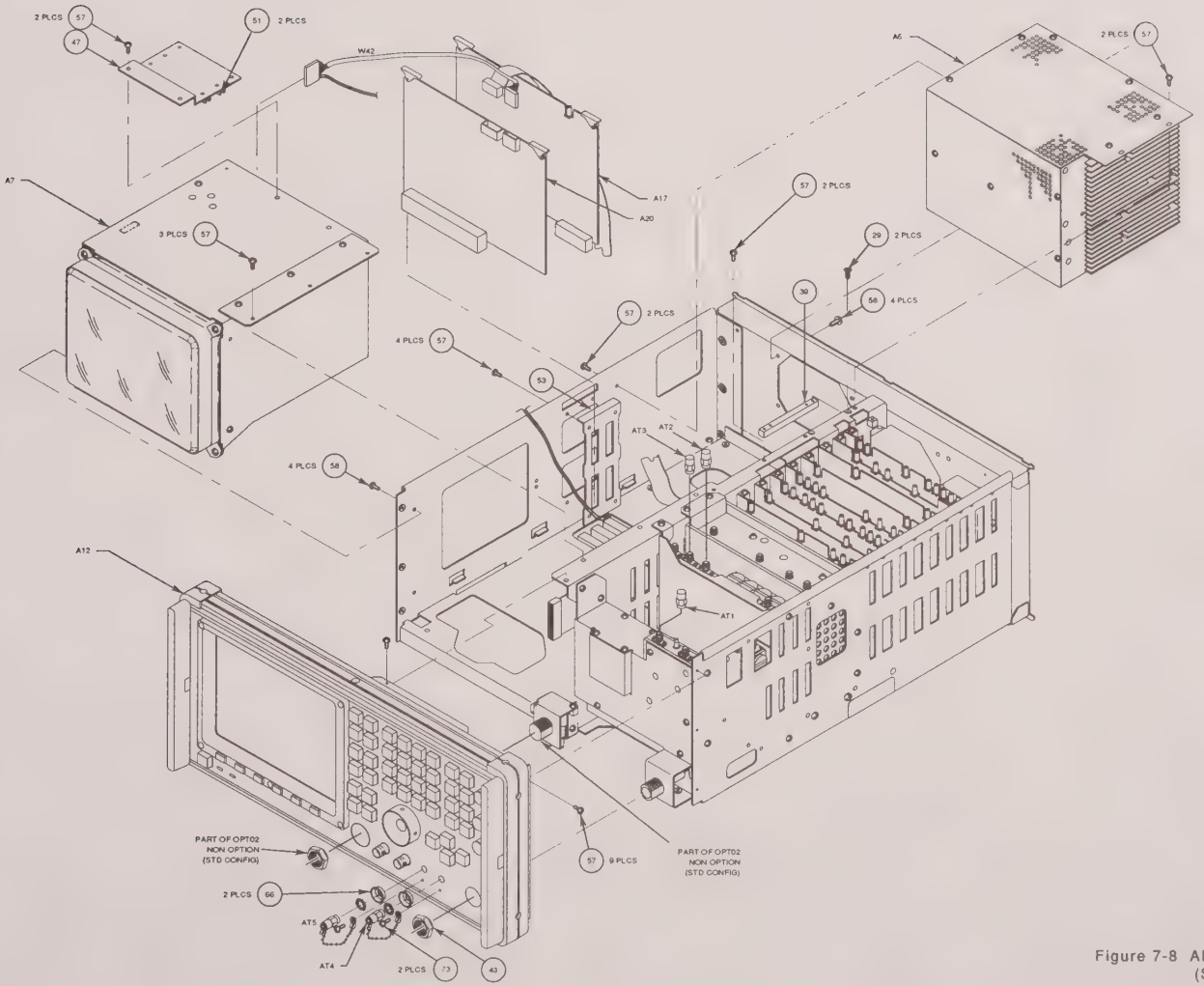


Figure 7-8 AN930A Composite Assembly
(Sheet 2 of 4)

0318003

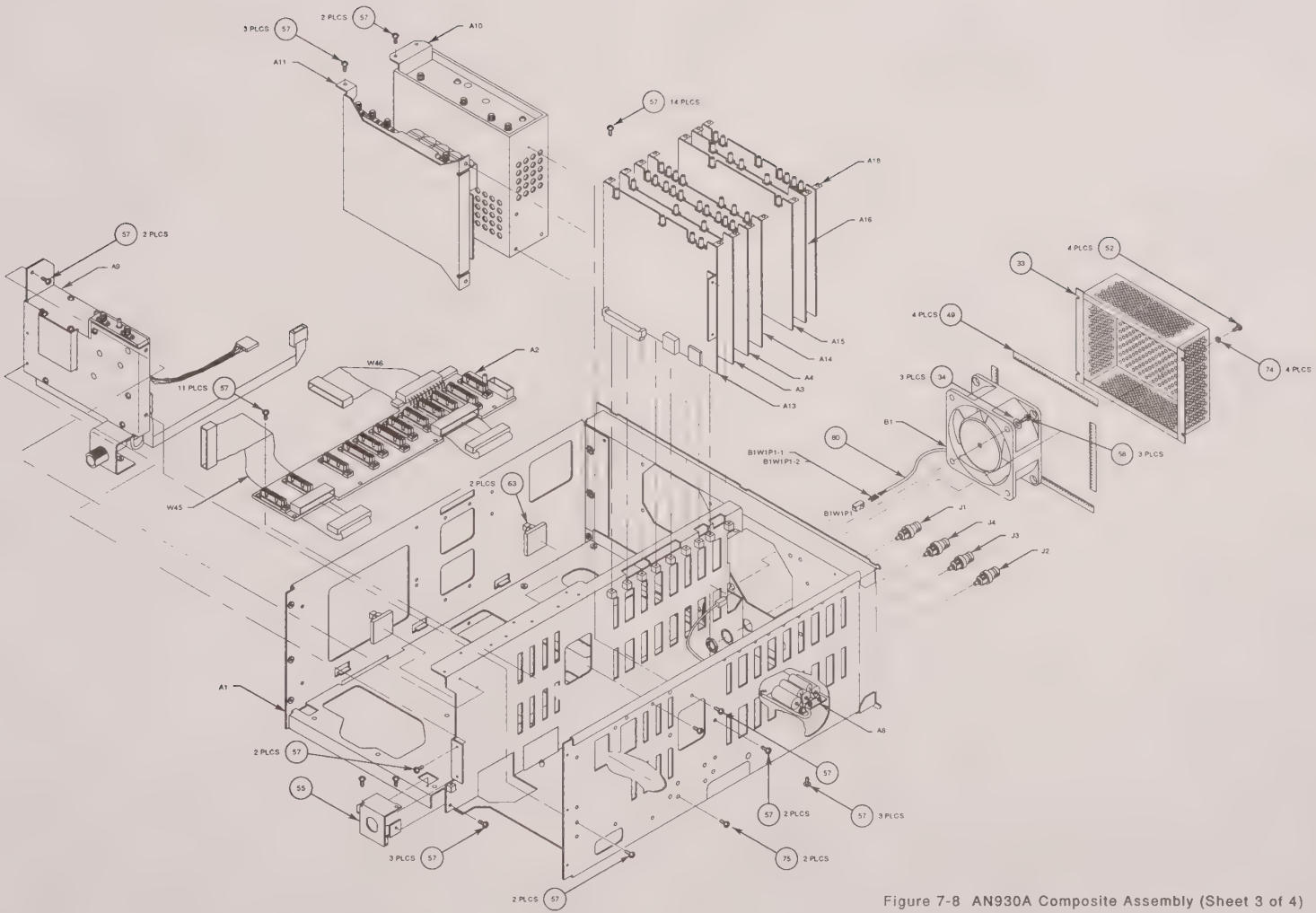


Figure 7-8 AN930A Composite Assembly (Sheet 3 of 4)

0318004

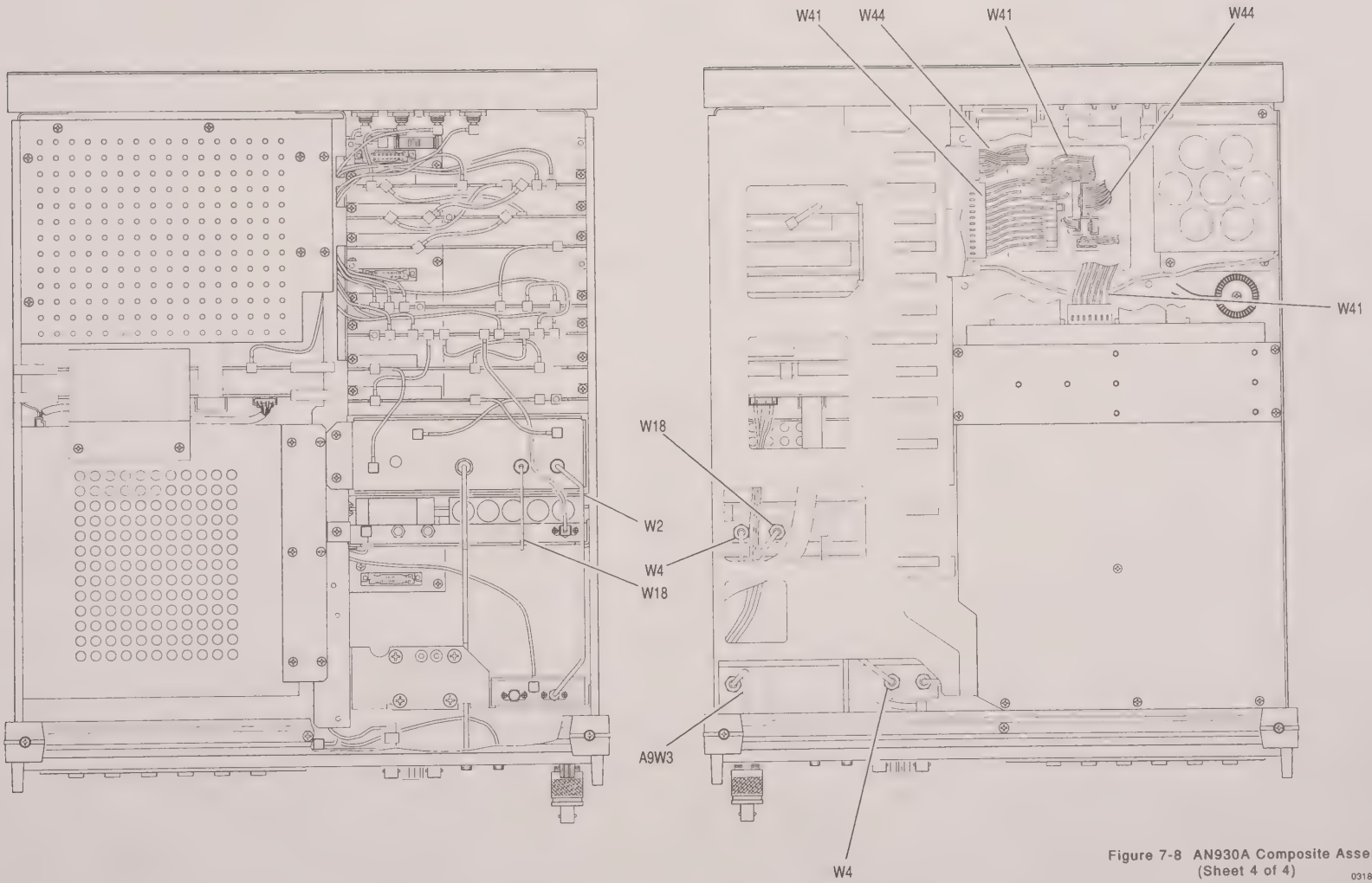


Figure 7-8 AN930A Composite Assembly
(Sheet 4 of 4) 0318005

7-5-3 COMPOSITE ASSEMBLY (7003-0340-000-A1)

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
*29	2803-0250-003	SCREW, 4-40 X 1/4 PFHM
*33	1416-7260-300	HOUSING, FAN EXTERNAL
*34	2840-0000-009	WASHER, FLAT,4,MS15795-803
*38	2506-7258-800	PLATE, COVER, MEMORY CARD
*39	2100-7260-600	BLOCK, POWER SUPPLY MTG
*41	1400-7251-100	BRKT, SPEAKER
*42	1400-7256-300	BRKT, RIGHT CARD GUIDE
*43	2850-8757-200	NUT, N CONN SPACER T/R PORT
*46	4104-7253-700	PULL TAB, MEMORY CARD
*47	1400-7264-200	BRKT, PC BOARD RETAINER
*48	2850-0000-008	NUT, HEX,REG PAT,4-40
*49	2845-0000-012	FINGER STK, TWISTED 1-SIDE SN*
*51	4104-7201-100	CARD GUIDE, NYLON 3" LG *
*52	2803-0188-006	SCREW, 4-40 X 3/16 PPHM
*53	1400-7255-800	BRACKET, LEFT CARD GUIDE
*55	1400-7274-100	BRACKET, COAX MTG
*57	2803-0250-006	SCREW, 4-40 X 1/4 PPHM
*58	2803-0313-006	SCREW, 4-40 X 5/16 PPHM
*59	2803-0438-006	SCREW, 4-40 X 7/16 PPHM
*60	2850-1692-600	SCREW, .340L35-6.25HH,4-40X.410
*61	2850-7601-301	SCREW, .188L4-40.19HH,4-40X.300
*62	4503-0003-100	RETAINTER, 3" ROUND SPEAKER
*63	6004-0000-001	MOUNT, TY-RAP,PANDUIT ABMS-AC
*66	2405-7251-500	RING, DRESS, SMA CONN
*68	8100-7263-900	FOAM, PAD, MEMORY CARD
*73	2803-0125-006	SCREW, 4-40 X 1/8 PPHM
*74	2840-0000-008	WASHER, FLAT,4,AN960-C4
*75	2804-0313-006	SCREW, 6-32X5/16 PHIL BIND HD
*77	1414-7256-200	COVER, WIRE HARNESS
*78	2803-0500-006	SCREW, 4-40 X 1/2 PPHM
*80	6012-0166-100	TUBING, PVC-105, 6 AWG,CLEAR
*81	2510-5064-301	HUB, TRANSFORMER MOUNTING
*82	2840-7600-216	WASHER, PHEN,.63OD,.140ID,.060T
*83	2803-0750-003	SCREW, 4-40 X 3/4 PFHM
U1	F000-0310-100	30A SYS SW FLASH ROM.BINV1.00
A1	6500-7276-500	MINOR ASSY, CHASSIS
A2	7010-7236-300	PCB ASSY, MOTHERBOARD
A3	7011-7241-100	FIRMWARE ASSY, SAMPLER SYNTH
A4	7011-7241-300	FIRMWARE ASSY, FREQ REF
A5	7009-7248-300	COAX KIT, AN930A/940
A6	7110-7200-100	POWER, SUPPLY,PURCH CEI 100W
A7	7005-7242-000	MECH ASSY, CRT
A8	7005-7243-200	MECH ASSY, FAN FILTER
A9	7005-7246-800	MECH ASSY, MICROWAVE RECEIVER
A10	7005-7241-800	MECH ASSY, YIG SYNTHESIZER
A11	7005-7244-800	MECH ASSY, RF RECEIVER
A12	7005-7247-200	MECH ASSY, FRONT PANEL, AN930A

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
A13	7011-7245-000	FIRMWARE ASSY, SWEEP SYNTH
A14	7011-7246-500	FIRMWARE ASSY, 410MHZ IF
A15	7010-7231-500	PCB ASSY, IF BANDWIDTH, STD
A16	7011-7245-600	FIRMWARE ASSY, LOG AMP
A17	7011-7240-500	FIRMWARE ASSY, DIGITIZER
A18	7011-7246-400	FIRMWARE ASSY, ANALOG
A19	7011-7241-900	FIRMWARE ASSY, SYSTEM CONTLR
A20	7011-7241-700	FIRMWARE ASSY, VIDEO CONT
AT1	5650-0010-200	TERMINATION, M SMA,50 OHM,1.15
AT2	5650-0010-200	TERMINATION, M SMA,50 OHM,1.15
AT3	5650-0010-200	TERMINATION,M SMA,50 OHM,1.15 (NON-OPTION 02)
AT4	2289-7204-100	CAP, 50 OHM TERM SMA/M W/CHAIN
AT5	2289-7204-100	CAP, 50 OHM TERM SMA/M W/CHAIN
B1	2600-0008-000	FAN, 12VDC 3.62 SQ 49.4 CFM
B1W1P1	2115-9002-002	CONN, RECT.098 PLUG2-P.SMP02VB
B1W1P1-1	2114-9002-001	CONTACT SKT26-22GA.SHF001T855
B1W1P1-2	2114-9002-001	CONTACT SKT26-22GA.SHF001T855
A19BT2	4000-0010-000	BTRY, LITHUM MEM BACK-UP
A19BT3	4000-0010-000	BTRY, LITHUM MEM BACK-UP
J1	2123-0000-074	CONN, BLKHD JACK BNC FT MTG
J2	2123-0000-074	CONN, BLKHD JACK BNC FT MTG
J3	2123-0000-074	CONN, BLKHD JACK BNC FT MTG
J4	2123-0000-074	CONN, BLKHD JACK BNC FT MTG
LS1	5950-0000-003	SPEAKER, FERRITE, 3 RND, 8 OHM
A19U41	3260-1005-001	IC, CMOS RAM 128X8 BIT 100NS
A19U42	3260-1005-001	IC, CMOS RAM 128X8 BIT 100NS
W2	6042-7281-900	COAX ASSY,.141MICR REC/YIG SYN
W4	6042-7285-100	COAX ASSY, ATTEN/REC IF
W18	6042-7285-900	COAX ASSY, .086 YIG SYN/REC IF
W39	6045-7281-200	RBN CA ASSY, GPIB/RS232
W40	6045-7281-400	RBN CA ASSY, MOTHERBD/REAR PNL
W41	7007-7280-800	WIRE HRN ASSY, POWER SUPPLY
W42	7007-7280-900	WIRE HARNESS ASSY, CRT
W43	7007-7282-400	WIRE HRN ASSY, SPEAKER
W44	7007-7283-000	WIRE HRN ASSY, PWR SUP/MOTHERBD
W45	6045-7281-500	RBN CA ASSY, KEYBOARD CNTRL
W46	6045-7281-300	RBN CA ASSY, MOTHERBD/SYS CNTRL
W47	6045-7281-100	RBN CA ASSY, EXT DISPLAY
A9W3	6042-7284-800	COAX ASSY, FP/ATTEN, AN930A (ANALYZER INPUT CONNECTOR [PART OF MICROWAVE RCVR ASSY])

7-5-4 AN930A/AN940 COAXIAL KIT (7009-7248-300)

Refer to 7-4-4.

7-6 OPTIONS AND NON-OPTIONS

Prefix all reference designators (cable numbers) with 72A1 for AN930, 02A1 for AN920, 04A1 for AN940 and 03A1 for AN930A. Refer to Figure 1-2 for location of Options and Non-Options. Refer to Figure 6-1 for location of cables.

7-6-1 OPTIONS

OPTION/ CABLE	PART NUMBER	DESCRIPTION
02	7001-7244-000	2.9 GHz TRACKING GEN
W10	6042-7283-300	COAX ASSY, S/R FT PNL/GEN OUT
W11	6050-0040-700	COAX ASSY, 316,R F SMB/R F SMB
W12	6042-7283-600	COAX ASSY, .141,TRKG GEN/FT PNL
W13	6042-7283-200	COAX ASSY, .086,TRKG GEN/REC IF
W38	6042-7283-400	COAX ASSY, .086,GEN OUT/YIG SYN
06	7001-7244-100	MEMORY EXPANSION (ONLY FOR AN930)
A19BT2	4000-0010-000	BTRY, LITHUM MEM BACK-UP
A19BT3	4000-0010-000	BTRY, LITHUM MEM BACK-UP
A19U41	3260-1005-001	IC, CMOS RAM 128X8 BIT 100NS
A19U42	3260-1005-001	IC, CMOS RAM 128X8 BIT 100NS
07	7001-7244-200	SUPPL BANDWIDTH FILTERS (ONLY FOR AN930)
W29	6050-0040-200	COAX ASSY, 316,R F SMB/R F SMB
08	7001-7244-300	QUASI-PEAK DETECTOR
W29	6050-0040-200	COAX ASSY, 316,R F SMB/R F SMB
09	7001-7244-400	HIGH STABILITY TIME BASE
W22	6050-0561-200	COAX ASSY, 316 RM SMA/RF SMB

7-6-2 NON-OPTIONS

NON-OPTION/ CABLE	PART NUMBER	DESCRIPTION
02	7001-7243-900	2.9 GHz TRACKING GEN
W9	6042-7281-700	COAX ASSY, S/R FT PNL/YIG SYN
09	7001-7245-400	MEDIUM STABILITY
W22	6050-0561-200	COAX ASSY, 316 RM SMA/RF SMB

APPENDICES

APPENDIX A - USER I/O CONNECTORS AND PIN-OUT TABLES

A-1 TABLE OF I/O CONNECTORS

NOTE: Prefix connector numbers according to spectrum analyzer model (72A1 for AN930, 02A1 for AN920, 03A1 for AN930A and 04A1 for AN940).

Planar Crown is a trademark of Lucas Weinschel.

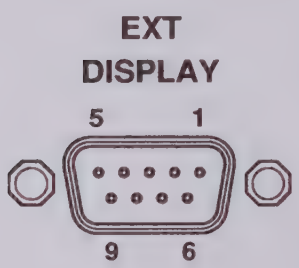
CONNECTOR	NUMBER	TYPE	IN/OUT	SIGNAL
10.7 MHz IF OUT	J4A	BNC	OUT	10.7 MHz Reference
410.7 MHz IF OUT	J3A	BNC	OUT	410.7 MHz
AC IN	A6J6	ac Plug	IN	ac Power
ANALYZER INPUT	A9J1	N - AN920, AN930, AN930A; Planar Crown™ - AN940	IN	RF
BAT IN	A6J7A	Power	IN	12 Vdc
EXT DC IN	A6J7B	Power	IN	11 to 30 Vdc
EXT DISPLAY	W47J1	9-Pin, D Receptacle	OUT	Video, EGA Format, IBM Compatible; See Pin-Out (Table A-2).
EXTERNAL INPUT	A12J2	BNC	IN	≤40 V Trigger, Oscilloscope Input or Low Frequency FFT Input
EXTERNAL MIXER IF	W6J1	SMA	IN	410.7 MHz IF
EXTERNAL MIXER LO	W9J1/ W10J1	SMA	OUT	3 to 12 GHz
EXT REF IN	J2A	BNC	IN	10 MHz, 2 to 5 V_P TTL
FUNCTION	W40J1	15-Pin, D Receptacle	IN/OUT	See Pin-Out (Table A-3).
IEEE-488 GPIB	W38J1	24-Pin Champ	IN/OUT	See Pin-Out (Table A-4).
PHONES	A12J3	1/8" (3.2 mm) Phone Jack	OUT	Audio (≤1 W through 8 Ω impedance)
REF OUT	A12J1A	BNC	OUT	100 MHz at -30 dBm (±0.5 dB)
RS-232	W38J2	9-Pin, D Plug	IN/OUT	See Pin-Out (Table A-5).
TRACKING GENERATOR (Option 02)	W12J1	N	OUT	100 kHz to 2.9 GHz at 0 to -70 dBm
VIDEO OUT	J1A	BNC	OUT	Demodulated Video

Table A-1 I/O Connectors

A-2 EXT DISPLAY CONNECTOR

PIN NUMBER	SIGNAL
1	Ground
2	R'
3	R
4	G
5	B
6	G'
7	B'
8	BHSYNC
9	BVSYNC

Table A-2 Pin-Out for EXT DISPLAY Connector



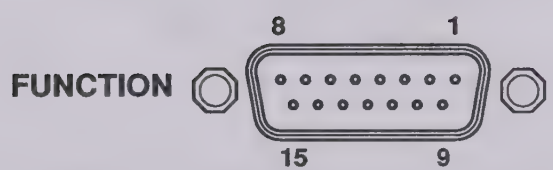
7218001

Figure A-1 EXT DISPLAY Connector

A-3 FUNCTION CONNECTOR

PIN NUMBER	SIGNAL
1	-12 V
2	+5 V
3	SER-CLK
4	SER-CNTRL
5	RLY DRV 1
6	$\overline{\text{SWEEP HOLD}}$
7	AUX VIDEO
8	AUX TRIGGER
9	+12 V
10	IRQ-SER
11	SER-STATUS
12	$\overline{\text{SLAVE-SEL}}$
13	RLY DRV 2
14	SWEEP
15	Ground

Table A-3 Pin-Out for FUNCTION Connector



7218002

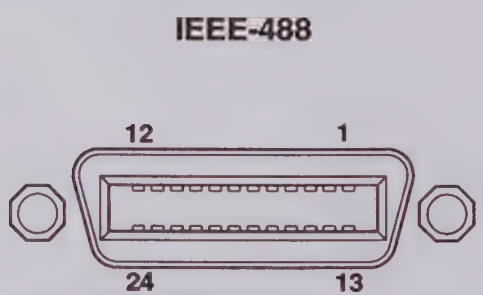
Figure A-2 FUNCTION Connector

A-4 IEEE-488 GPIB CONNECTOR

The IEEE-488 GPIB Connector (28) complies with ANSI/IEEE Standard 488.2-1987.

PIN NUMBER	SIGNAL	PIN NUMBER	SIGNAL
1	DIO 1	13	DIO 5
2	DIO 2	14	DIO 6
3	DIO 3	15	DIO 7
4	DIO 4	16	DIO 8
5	EQI	17	REN
6	DAV	18	Ground
7	NRFD	19	Ground
8	NDAC	20	Ground
9	IFC	21	Ground
10	SRQ	22	Ground
11	ATN	23	Ground
12	Ground	24	Ground

Table A-4 Pin-Out for IEEE-488 GPIB Connector



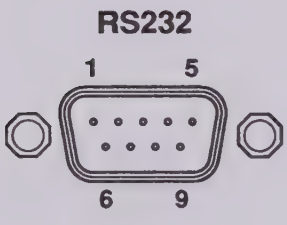
7218003

Figure A-3 IEEE-488 GPIB Connector

A-5 RS-232 CONNECTOR

PIN NUMBER	SIGNAL
1	CD
2	TXD
3	RXD
4	Not Connected
5	Ground
6	DTR
7	$\overline{\text{CTS}}$
8	$\overline{\text{RTS}}$
9	Not Connected

Table A-5 Pin-Out for RS-232 Connector



7218004

Figure A-4 RS-232 Connector

APPENDIX B - TEST EQUIPMENT REQUIREMENTS

B-1 GENERAL

This Appendix contains a list of test equipment suitable for performing all of the maintenance procedures contained in this manual. Other equipment meeting the specifications listed in this Appendix may be substituted in place of the recommended models. The equipment listed in this Appendix may exceed the minimum required specifications for some of the procedures contained in this manual.

B-2 RECOMMENDED TEST EQUIPMENT

TYPE	MODEL	SPECIFICATIONS
50 Ω Termination	AMPHENOL 31-2-1004 or Equivalent	
100 MHz Amplifier	HP8447 or Equivalent	Frequency Range: 100 MHz Gain: ≈20 dB
100 MHz Low-Pass Filter	MINI-CIRCUITS BLP-100 or Equivalent	Fixed loss at 100 MHz
Digital Multimeter (DMM)	FLUKE 8010A or Equivalent	Range: ±50.00 Vdc 0.5 Ω to 1.1 MΩ Resolution: 5.5 Digits Accuracy: ±0.1%
Diode Switch	WATKINS-JOHNSON S1 or Equivalent	Frequency: 100 MHz On/Off Voltage Ratio: +3.0 V (desired - +2.5 V/On, -0.5 V/Off)
EGA Monitor		EGA compatible Monitor
External 10 MHz Reference		Accuracy: ±≤0.01 Hz
Frequency Counter	FLUKE 7220A or Equivalent	Frequency Range: 10 to 125 MHz Resolution: 0.1 Hz Accuracy: ±1 Count (±Time Base Error)

TYPE	MODEL	SPECIFICATIONS
Function Generator	HP8116A or Equivalent	Functions: Pulse, Sine Wave, Square Wave Frequency: 0.1 Hz (PRF) to >5 MHz Pulse Width: 1 to 200 µs Output Level: 15 mVP-P to 15 VP-P
Headphones		Type: Monophonic or Adapted Impedance: 8 Ω
Low Noise Signal Generator	HP8640 or Equivalent	Frequency: 100 to 1000 MHz Noise: ≤-110 dBc at 10 kHz offset ≤-115 dBc at 30 kHz offset
Measuring Receiver	HP8903B or Equivalent	Capability: Signal, Noise and Distortion measurement (10 dB SINAD)
Microwave Signal Generator	HP8340B or Equivalent	Frequency: 10 MHz to 26.5 GHz Level: -35 to 0 dBm
Phase-Locked Dielectric Resonator Oscillator (PDRO) Circuits		Refer to Appendix D.
Oscilloscope	TEK 2235 or Equivalent	Bandwidth: dc to 100 MHz Measured Level : 1 mVP-P to 5 VP-P Vertical Accuracy: ±10% Has fixed Probe Adjust Output

TYPE	MODEL	SPECIFICATIONS
Power Meter	BOONTON 4200 (with Power Sensors BOONTON 51071 and BOONTON 51011 [4B]) or Equivalent	Frequency: 100 kHz to 26.5 GHz Range: -40 to +10 dBm Accuracy: ±0.05 dB
Power Splitter	HP11667B or Equivalent	Frequency: 10 MHz to 26.5 GHz
Scope Normalizer		Refer to Appendix D.
Signal Generator	MARCONI 2031 or Equivalent	Frequency Range: 100 to 415 MHz Resolution: 0.1 to 100 Hz Accuracy: ±0.1 Hz (with External 10 MHz Reference) RF Output Level: ≤-85 to 0 dBm Modulation: 3 kHz to 5 MHz FM 30% to 50% AM (1 kHz)
Spectrum Analyzer	IFR AN930 or Equivalent	Frequency Range: 10 to 415 MHz Resolution Bandwidth: 200 Hz to 5.0 MHz Display Accuracy Log: <±0.1 dB/dB
Tracking Generator Test Cable		Refer to Appendix D.

APPENDIX C - REPACKING FOR SHIPMENT

C-1 SHIPPING INFORMATION

IFR Test Sets returned to factory for calibration, service or repair must be repackaged and shipped subject to the following conditions:

C-1-1 AUTHORIZATION

Do not return any products to factory without authorization from IFR Customer Service Department.

CONTACT:

IFR Systems, Inc.
Customer Service Dept.
10200 West York Street
Wichita, Kansas 67215-8935

Telephone: 800-835-2350
FAX: 316-524-2623

C-1-2 TAGGING TEST SETS

All test sets must be tagged with:

- Owner's identification and address.
- Nature of service or repair required.
- Model No. and Serial No.

C-1-3 SHIPPING CONTAINERS

Test Sets must be repackaged in original shipping containers using IFR packing materials. If original shipping containers and materials are not available, contact IFR Customer Service Department for shipping instructions.

C-1-4 FREIGHT COSTS

All freight costs on non-warranty shipments are assumed by the customer. (See "Warranty Packet" for freight charge policy on warranty claims.)

C-2 REPACKING PROCEDURE (Figure C-1)

- Make sure bottom packing mold is seated on floor of shipping container.
- Adjust handle to lay ur. ıcked against Test Set as shown.
- Place Elastic Retainer around Test Set to secure handle.
- Carefully wrap Test Set with polyethylene sheeting.
- Place Test Set into shipping container, making sure Test Set is securely seated in bottom packing mold.
- Place top packing mold over top of Test Set and press down until mold rests solidly on bottom packing mold.

- Close shipping container lids and seal with shipping tape or an industrial stapler. Tie all sides of container with break resistant rope, twine or equivalent.

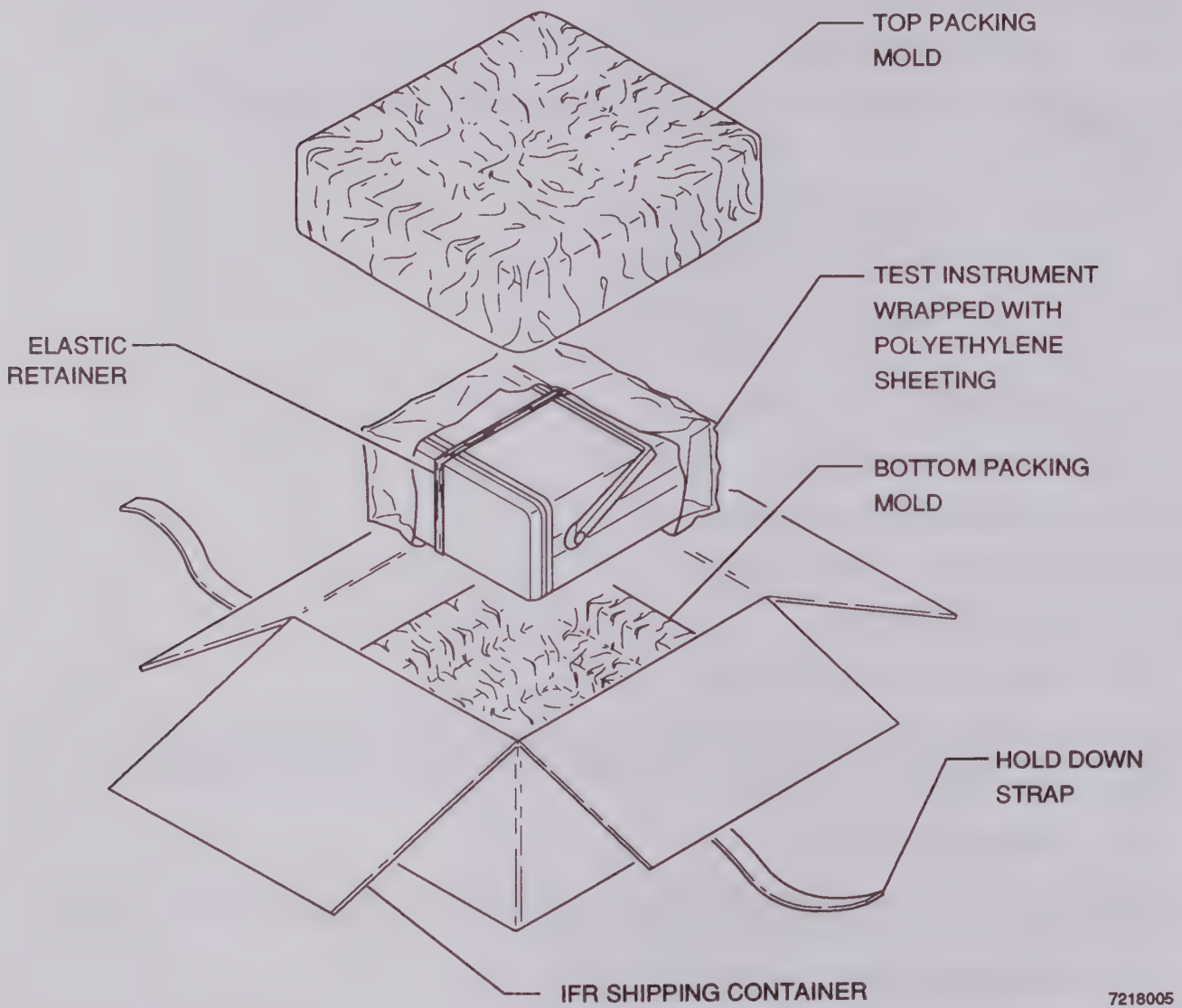


Figure C-1 Repacking for Shipment

APPENDIX D - TEST EQUIPMENT CONSTRUCTION

D-1 SCOPE NORMALIZER

D-1-1 GENERAL

The Scope Normalizer, used to test the EXTERNAL INPUT Connector, provides an impedance matching standard.

D-1-2 ASSEMBLY

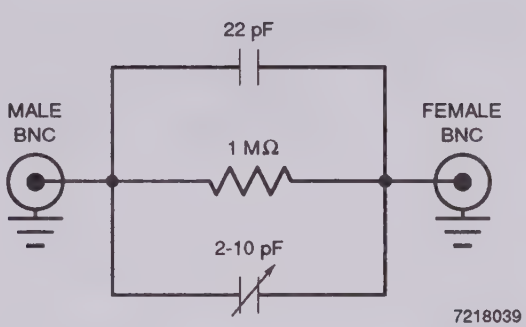


Figure D-1 Scope Normalizer

STEP	PROCEDURE

1. Assemble Scope Normalizer according to Figure D-1, using accurate components.
2. Adjust variable capacitor for 27 pF capacitance, as measured by accurate Impedance Analyzer (HP4192 or equivalent) or LCR Meter.

D-2 PDRO CIRCUITS

D-2-1 GENERAL

The Phase-Locked Dielectric Resonator Oscillator (PDRO) Circuits generate clean high microwave frequencies with low enough noise to accurately test frequency stability.

D-2-2 ASSEMBLY

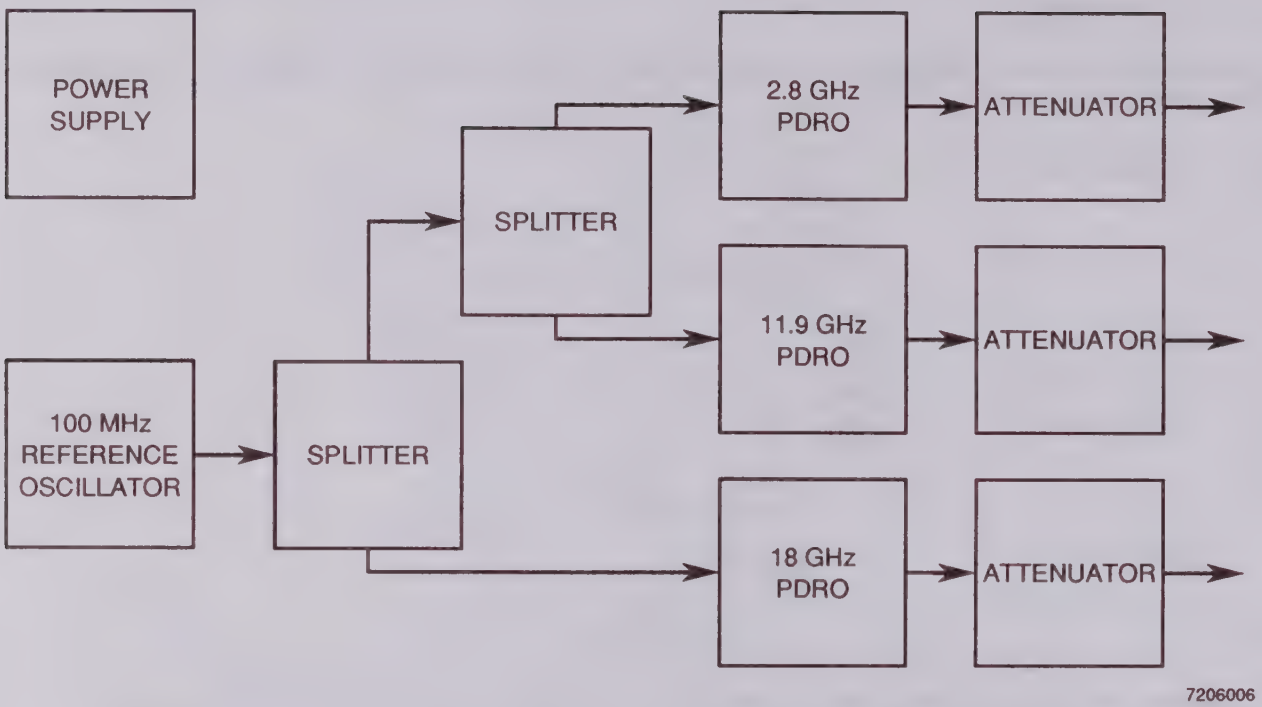


Figure D-2 PDRO Circuits Setup Diagram

STEP PROCEDURE

1. Refer to Table D-1 for list of recommended components.

COMPONENT	MODEL	QUANTITY
2.8 GHz PDRO	CTI MP-2353 or Equivalent	1
11.9 GHz PDRO	CTI PEDRO-1432 or Equivalent	1
18 GHz PDRO	CTI PEDRO-1433 or Equivalent	1
100 MHz Oscillator	WENZEL 500-02171B or Equivalent	1
Attenuator		3
Power Supply	≈15 Vdc or According to Voltage Requirements of Equivalent Models	1
Splitter	MINI-CIRCUITS PSC2-1 or Equivalent	2

Table D-1 PDRO Circuits Component List

2. Assemble PDRO Circuits according to Figure D-2. Use Attenuators to provide ≈0 dBm carrier level for each output.

D-3 TRACKING GENERATOR (OPTION 02) TEST CABLE

D-3-1 GENERAL

The Tracking Generator Test Cable allows for accurate calibration of the optional Tracking Generator.

D-3-2 ASSEMBLY

Connect two N type female connectors to a semi-rigid coaxial cable, as short as possible (≈7 to 10 inches [17 to 25 cm]), but long enough to effectively connect to the ANALYZER INPUT Connector and TRACKING GENERATOR Connector.

APPENDIX E - ABBREVIATIONS

A	
A	Amperes
AC	Alternating Current
ac	Alternating Current
AGC	Automatic Gain Control
AM	Amplitude Modulation
AMPL	Amplifier
ANSI	American National Standards Institute
ANX	Analyzer
APPS	Applications
ASCII	American National Standard Code for Information Interchange
ASTD	Assisted
AT	Automated Terminal
ATTN	Attenuation
AUTO	Automatic
AUX	Auxiliary
AVG	Average
B	
BAT	Battery
BFO	Beat Frequency Oscillator
BINS	Sample Points
BIOS	Basic Input/Output System
BPF	Bandpass Filter
bps	Bits per second
BW	Resolution Bandwidth
C	
C	Celsius or Centigrade
CAL	Calibration
ccw	Counterclockwise
CF	Center Frequency
CISPR	Comite Internation Special des Pertubation Radio-electroniquis (International Special Committee on Radio Interference
cm	Centimeter (10^{-2} meters)
CMOS	Complementary Metal-Oxide Semiconductor
CONFIG	Configure
Cont	Continued
CPU	Central Processing Unit
CRT	Cathode Ray Tube
CTS	Clear to Send
CW	Continuous Wave
cw	Clockwise
D	
DAC	Digital to Analog Converter
dB	Decibels
dBc	Decibels above carrier
dBµW	Decibels relative to 1 microwatt
dBµV	Decibels relative to 1 microvolt
dBmV	Decibels relative to 1 millivolt
dBm	Decibels relative to 1 milliwatt

D	
dB_{P-P}	Decibels, Peak to Peak
DC	Direct Current
dc	Direct Current
DET	Detector
DFT	Discrete Fourier Transform
DIAG	Diagnostics
DIR	Directory
DIV	Division
Div	Division
DLY	Delay
DMA	Direct Memory Access
DRAM	Dynamic RAM
DSPL	Display
E	
ECL	Emitter-Coupled Logic
EGA	Enhanced Graphics Adaptor
EIA	Electronics Industries Association
ENH	Enhanced
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ERR	Error
ESC	Escape
ESD	Electrostatic discharge
EXT	External
F	
FCC	Federal Communications Commission
FD	Frequency Deviation
FFT	Fast Fourier Transform
FM	Frequency Modulation
FREQ	Frequency
FRNT	Front
FS	Frequency Span
G	
GHz	Gigahertz (10^9 Hertz)
GND	Ground
GPIB	General Purpose Interface Bus
GRAT	Graticule
GSP	Graphics Signal Processor
H	
H	Harmonic
h	Hexadecimal
HARM	Harmonic
Hz	Hertz
HPF	High-Pass Filter
HPGL	Hewlett-Packard Graphic Language
Hr	Hour

I	
IC	Integrated Circuit
IF	Intermediate Frequency
IEEE	Institute of Electrical and Electronic Engineers
INT	Internal
int	Integer
I/O	Input/Output
ISA BUS	Industry Standard Architecture Bus
ISP	Integrated System Peripheral
K	
KBD	Keyboard
kbytes	Kilobyte (10^3 bytes)
kHz	Kilohertz (10^3 Hertz)
kΩ	Kilo Ohm (10^3 Ohms)
L	
LIN	Linear
LISN	Line Impedance Stabilization Network
LLIM	Lower Limit
LO	Local Oscillator
LOG	Logarithmic
log	Logarithm
LPF	Low-Pass Filter
LVL	Level
M	
MAN	Manual
MF	Modulation Frequency
MHz	Megahertz (10^6 Hertz)
MKR	Marker
MΩ	Megaohm (10^6 Ohms)
µF	Microfarad (10^{-6} farads)
µH	Microhenry (10^{-6} henries)
µs	Microsecond (10^{-6} seconds)
µV	Microvolt (10^{-6} volts)
µW	Microwatt (10^{-6} watts)
mW	Milliwatt (10^{-3} watts)
MTRK	Marker Track
ms	Millisecond (10^{-3} seconds)
mV	Millivolt (10^{-3} volts)
mV_{P-P}	Millivolt, Peak to Peak
N	
NO	Number
No.	Number
NV RAM	Non Volatile RAM
NV SRAM	Non Volatile SRAM
O	
OET	Office of Engineering and Technology
OF	Offset Frequency

P	
PAL	Programmable Array Logic
PC	Printed Circuit
PC	Personal Computer
PDRO	Phase-Locked Dielectric Resonator Oscillator
pF	Picofarad (10^{-9} farads)
Pg.	Page
PK	Peak
PLL	Phase-Locked Loop
POS	Position
ppm	Parts per Million
PREAMP	Preamplifier
PREV	Previous
PRF	Pulse Repetition Frequency
PS	Preselector
PWR	Power
Q	
QPEAK	Quasi-Peak
R	
RAM	Random Access Memory
RBW	Resolution Bandwidth
RC	Resistor-Capacitor
RCI	Remote Command Interpreter
RCL	Recall
REF	Reference
RFLD	Reflected
R	
REJ	Reject
RET	Return
RF	Radio Frequency
RFI	Radio Frequency Interference
RFR	Ready For Receiving
ROM	Read-Only Memory
RTS	Request to Send
S	
s	Second
SA	Sampler Output Frequency
SCOP	Oscilloscope
SCPI	Standard Commands for Programmable Instruments
SDR	Signal-to-Distortion Ratio
SINAD	Signal, Noise and Distortion
SIPO	Serial In-Parallel Out
SNGL	Single
SNR	Signal-to-Noise Ratio
SPI	Serial Peripheral Interface
SRAM	Static RAM
SRQ	Service Request
SSB	Single Sideband
ST	Start Frequency
STABY	Stability
STD	Standard
SUPPL	Supplemental
SWR	Standing Wave Ratio

	T
TIA	Telecommunications Industries Association
THD	Total Harmonic Distortion
TMAC	Test Macro Language
TRIG	Trigger
TRK	Tracking
trunc	Truncated
TSTS	Tests
TTL	Transistor-Transistor Logic
TV	Television
	U
ULIM	Upper Limit
UUT	Unit Under Test
	V
V	Vertical
V	Volt
VAC	Volts, Alternating Current
	V
VBW	Video Bandwidth
VCO	Voltage Controlled Oscillator
Vdc	Volts, Direct Current
VH	VCO Harmonic
V_P	Volts, Peak
V_{PP}	Volts, Peak to Peak
V_{P-P}	Volts, Peak to Peak
VRAM	Video RAM
VSWR	Voltage Standing Wave Ratio
	W
W	Watts
	Y
YF	YIG Frequency
YIG	Yttrium Iron Garnett
YN	YIG Number

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